HP 8620B

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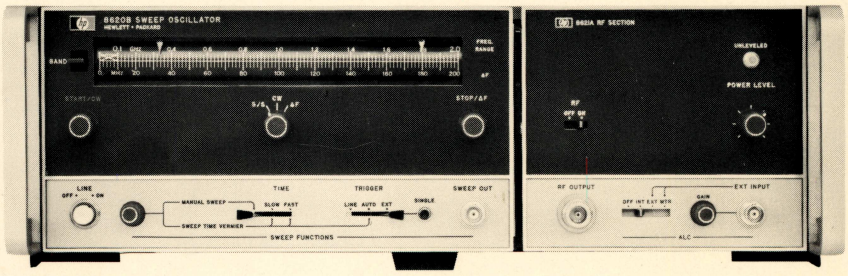
OPERATING AND SERVICE MANUAL

SN
Prefix
1051A

SWEEP OSCILLATOR

8620B



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HP 8620B

CERTIFICATION

The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facility.

WARRANTY AND ASSISTANCE

All Hewlett-Packard products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain major components listed in the operating manual, for the specified period. We will repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard. No other warranty is expressed or implied. We are not liable for consequential damages.

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PRELIMINARY OPERATING AND SERVICE MANUAL

SWEEP OSCILLATOR
8620B

SERIAL PREFIX 1051A

This manual applies directly to HP Model 8620B Sweep Oscillator having serial prefix number 1051A.

SERIAL PREFIXES NOT LISTED

For serial prefixes above 1051A a "Manual Changes" sheet is included with this manual.

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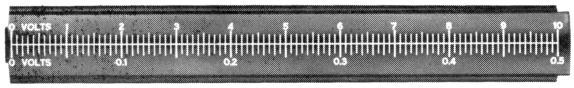
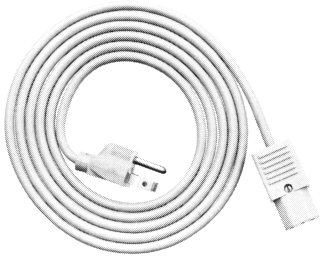
HP 8620B

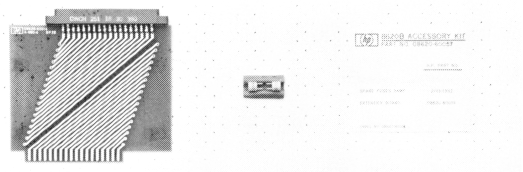
CALIBRATION SCALE



POWER CABLE



ACCESSORY KIT



RACK MOUNTING KIT

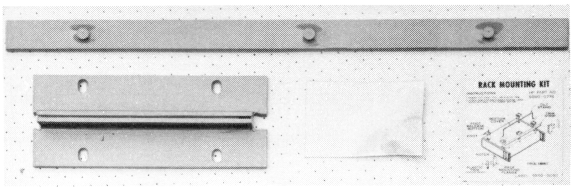


Figure 1-1. Model 8620B Sweep Oscillator with Supplied Accessories

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This manual contains operating and service information for the Hewlett-Packard Model 8620B Sweep Oscillator. The Model 8620B, together with an RF Section (Model 8621A) and appropriate oscillator modules (Models 8632A, 8633A, etc.), comprises an electronically-tuned sweep signal source. Operating and service information for the RF Section and the oscillator modules is contained in separate manuals.

1-3. INSTRUMENTS COVERED BY MANUAL

1-4. The Model 8620B carries a nine-digit and one letter serial number (0000A00000). The first four digits comprise the serial prefix, the letter is the country of origin, and the last five digits form the sequential suffix. This manual applies directly to an instrument with a serial number prefix the same as listed on the title page. For instruments with a serial prefix number lower than those listed on the title page, refer to Section VII. For instruments with a serial prefix number higher than those listed on the title page, refer to a yellow "Manual Changes" insert.

1-5. DESCRIPTION

1-6. The Hewlett-Packard Model 8620B Sweep Oscillator, together with an appropriate RF Section and plug-in oscillator modules, forms a completely solid-state self-contained multiband sweep signal source. The Model 8620B is designed specifically for use with the Hewlett-Packard Model 8410A/8411A Network Analyzer system to provide a complete microwave measurement system. Other systems can also be built, using the Model 8620B as a swept signal source.

1-7. The front panel is designed for simplicity and ease of operation. The frequency controls are mounted on the upper portion of the front panel (black region) and the sweep function controls on the lower portion (gray region). Each control has its name engraved right above it, with the exception of the function control, located at the center of the front panel.

1-8. The function control provides a positive identification of the function selected (S/S, CW, ΔF). S/S (start-stop) operation produces a manual, single, or automatic sweep over the frequency range indicated by the START and STOP control settings. CW operation[1] produces a fixed CW frequency that is determined by the CW control setting. This CW frequency is also the center frequency during ΔF operation. ΔF operation produces a manual, single, or automatic sweep that is symmetrical about the CW control frequency setting. The sweep width (amount of frequency deviation) is determined by the ΔF control setting and is adjustable from zero to ten percent of the frequency band. Complete specifications for the 8620B Sweep Oscillator mainframe are given in Table 1-1.

1-9. ACCESSORIES SUPPLIED

1-10. A detachable power cord, rack mounting kit, accessory kit, and calibration scale are supplied with the Model 8620B. The power cord and rack mounting kit are described in Section II, Installation.

1-11. Accessory Kit. The Accessory kit contains a reversing extender board and two three-amp fuses. The reversing extender board permits all the necessary interconnections to be made between the Model 8620B mainframe and the plug-in board assembly being serviced. The two three-amp fuses are spares for the A4 and A5 Regulator Board Assemblies.

1-12. The calibration scale is inserted in the band drum before leaving the factory. This scale is used for calibrating the Model 8620B mainframe. It provides convenient scale notations to assist in calibration, but is not essential to the calibration procedure.

1-13. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-14. In order to have a complete operating unit, the Model 8620B Sweep Oscillator mainframe must have an RF Section plug-in with appropriate oscillator modules installed for the frequency band selected. Various RF Section configurations will be available to cover the frequency range between 0.1 and 18 GHz.

1-15. EQUIPMENT AVAILABLE

1-16. Service Kit

1-17. A service kit containing a plug-in extender cable, extender boards, adjustment tools, and RF

[1] In CW operation the technical performance of the 8620B approaches signal-generator quality.

Table 1-1. Specifications

SPECIFICATIONS

8620B SWEEP OSCILLATOR
(With RF Oscillator Modules and Plug-in RF Section Installed)

FREQUENCY

Frequency Range: Determined by band switching lever and RF oscillator modules installed in plug-in RF section.

Frequency Linearity: Refer to RF unit specifications.

SWEEP FUNCTIONS

START-STOP Sweep: Sweeps from START to STOP frequency setting. Selected by function switch at the center of the front panel.

Range: Both settings continuously and independently adjustable over the entire frequency range; can be set to sweep either up or down in frequency.

End-point Accuracy: Refer to RF unit specifications, same as frequency accuracy.

ΔF Sweep: Sweeps symmetrically upward in frequency, centered on START/CW setting. Selected by function switch at center of the front panel.

Width: Contintinuously adjustable from zero to 10% of usable frequency band. Width controlled by STOP/ΔF control. Width dial scale calibrated directly in MHz.

Width Accuracy: ±1% of maximum ΔF; ±2% of ΔF being swept.

Center-Frequency Accuracy: Refer to RF unit specifications, same as frequency accuracy.

CW Operation: Single-frequency RF output selected by function switch at center of the front panel. Frequency controlled by START/CW knob.

Accuracy: Refer to RF unit specifications, same as frequency accuracy.

Preset Frequencies: Start-Stop sweep end points can be used as two preset CW frequencies in the manual sweep mode.

SWEEP MODES

Auto: Sweep recurs automatically.

Line: Sweep is synchronized with the ac power line for power line frequencies of up to 60 Hz.

External: Sweep is actuated by externally applied signal >+2V peak, >1/2 μs pulse width and <1.0 MHz repetition rate. Signal applied to external trigger input on rear panel. Sweep time determined by sweep time range switch and sweep time vernier control.

Single Sweep: Activated by front panel pushbutton (to right of trigger select switch) with trigger select switch in the external position. Sweep time determined by sweep time range switch and sweep time vernier control.

Sweep Time: Continuously adjustable in two ranges, fast and slow. Vernier control to left of time select switch.

Fast: Typically 0.06 to 0.35 seconds.

Slow: Typically 1 to 60 seconds.

Manual Sweep: Front panel control provides continuous manual adjustment of frequency between end frequencies set in any of the above sweep functions.

Sweep Output: Direct-coupled sawtooth, zero to approximately +10V, concurrent with swept RF output. Zero at start of sweep, approximately +10V at end of sweep regardless of sweep width or direction. Source impedance approximately 10,000 ohms.

Table 1-1. Specifications (Continued)

MODULATION

Internal AM: Square-wave modulation continuously adjustable from 950 to 1050 Hz on all sweep times (internal adjustment). On/Off ratio, refer to RF unit specifications.

External AM:

Frequency Response: dc to 100 kHz unleveled, dc to 50 kHz leveled, at rated leveled output power.

Sensitivity: Refer to RF unit specifications.

Input Impedance: Approximately 5000 ohms.

External AM: Refer to RF unit specifications.

Phase-Lock: Refer to RF unit specifications.

GENERAL

Blanking: With blanking switch enabled, RF automatically turned off during retrace, and turned on after completion of retrace. On automatic sweeps, RF is on long enough before sweep starts to stabilize external circuits and equipment whose response is compatible with the selected sweep rate.

Blanking Output: Direct-coupled rectangular pulse approximately +6.0V coincident in time with RF blanking available from Z axis output jack in the rear. Source impedance approximately 1000 ohms.

Pen Lift: For use with X-Y graphic recorders. Penlift signals available at two rear panel BNC connectors; either shorted during sweep and open during retrace or open during sweep and shorted during retrace have been made available. Available only on slow sweep speed.

Furnished: 7-1/2-foot (2290 mm) power cable with NEMA plug; rack-mounting kit; 2 spare 3 amp fuses; extender board for servicing; and calibration scale.

Power: 115 or 230 volts ±10%, 50 to 400 Hz. Approximately 140 watts.

Dimensions: 5-1/4 in. (133,4 mm) high, 11 in. (279,4 mm) deep, 16-3/4 in. (425,5 mm) wide.

Weight (not including RF oscillator modules or plug-in RF section): Net, 25 lb (11,5 kg).

service cables may be obtained from Hewlett-Packard by Service Kit Part No. 8620-60030. This is supplied for convenience in aligning and troubleshooting the mainframe, the RF Section, and the oscillator modules. Parts contained in the service kit are listed in Table 1-2.

1-18. Model 8410A/8411A Network Analyzer

1-19. The Model 8620B Sweeper is designed for use with the Hewlett-Packard Model 8410A Network Analyzer System. The combination of the Model 8410A Network Analyzer, the Model 8411A Frequency Converter, and an appropriate display plug-in forms a phasemeter and a ratiometer for direct phase and amplitude ratio measurement on RF voltages. These measurements can be made on single frequencies and on swept frequencies in overlapping octave bands from 110 MHz to 12.4 GHz.

1-20. Power Meters and Crystal Detectors

1-21. Depending on the RF section used, the RF output can be externally leveled using power meters or crystal detectors. Refer to the Operating and Service Manual of the RF Section used for detailed information on leveling systems that may be used with the 8620B/RF Section combination.

1-22. RECOMMENDED TEST EQUIPMENT

1-23. Equipment required to maintain the Model 8620B is listed in Table 1-3. Other equipment may be substituted if it meets or exceeds the critical specifications listed in the table.

Table 1-2. Contents of Service Kit No. 08620-60030

Name	Part No.	Use
Extender Cable	08620-60032	Allows RF Section to be outside mainframe during adjustment or service and still have the necessary interconnections.
Service Board	08620-60037	Allows probing of RF Section interface connector during performance testing or servicing.
18 pin Extender Board	5060-2041	Extends oscillator module Boards for troubleshooting.
Adjustment Tool	8830-0024	Fits screw-adjust control of miniature potentiometers.
8633A Troubleshooting Board	08633-60012	Substitutes dummy YIG coil or dummy YIG-driver transistor for fault isolation.
RF Connector, straight adapter, SMA Jack to SMA Jack	1250-1158	Adapts RF service extender cable connectors from plug to jack.
RF Service Cable (2 each)	8120-1578	Allows servicing of RF Unit or Heterodyne Module.

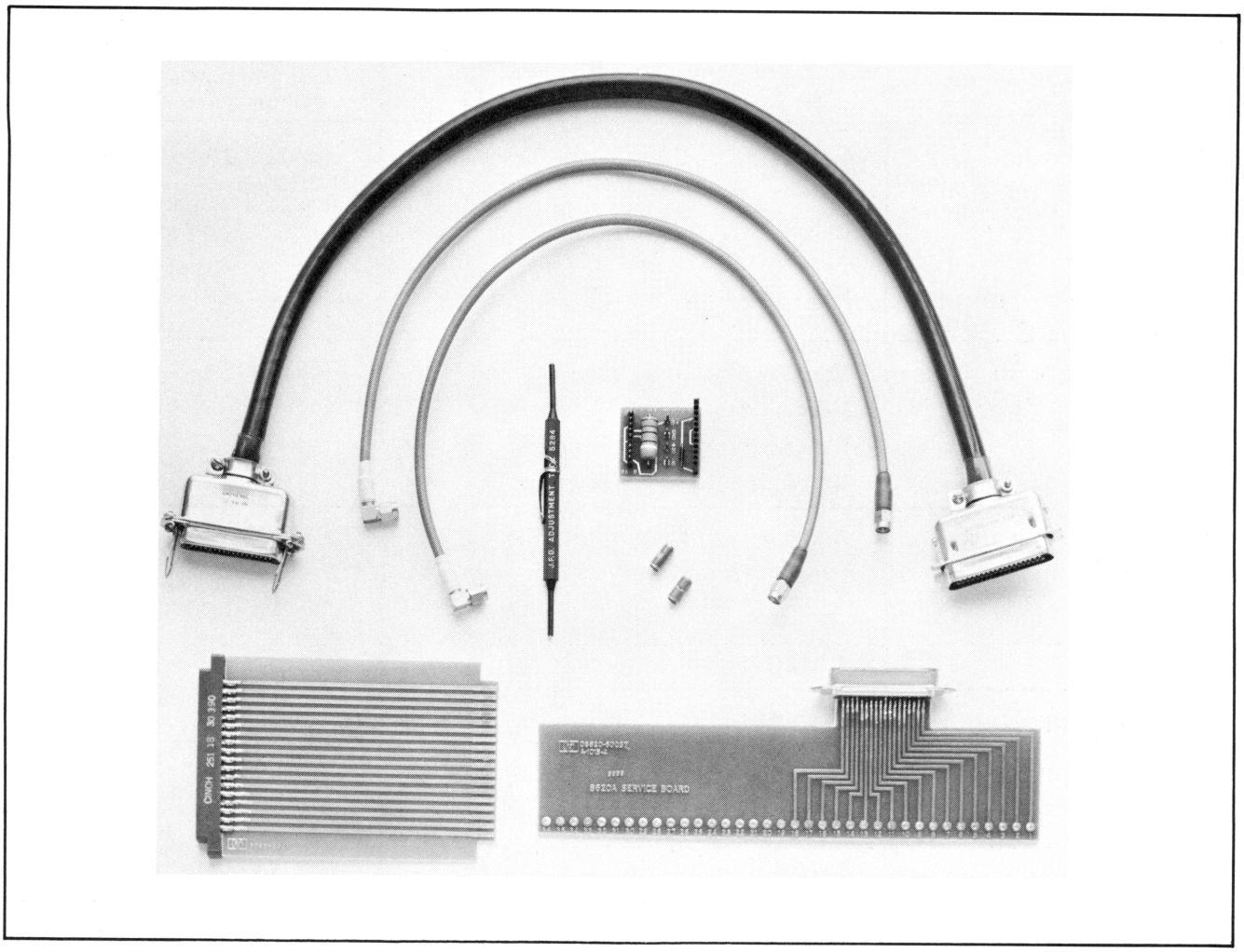


Figure 1-2. Service Kit HP Part No. 08620-60030

Table 1-3. Test Equipment Required for Maintenance

Instrument Type	Critical Specifications	Recommended HP Model	Use*
Oscilloscope with Dual-Trace Vertical Amplifier and 10:1 probes	Vertical Amplifier: Dual Trace with 10:1 probes Bandwidth: 20 MHz Minimum Vertical Sensitivity: 5 mV/Div Horizontal Sweep Rate: 1 μs/Div minimum	180A/1801A/ 1820A	P,A,T
Oscilloscope with High-Sensitivity Vertical Amplifier	Vertical Amplifier: Single Channel Vertical Sensitivity: 50 μV/Div Bandwidth: 5 kHz minimum Horizontal Sweep Rate: 1 μs/Div	140B/1407A/ 1422A	T
DC Digital Voltmeter	Accuracy: 0.05% Input Impedance: 10 megohms minimum Automatic Range Selection: Range to 150 Vdc	3460B	P,A,T
DC Power Supply	Output: +2 Vdc, 500 mA	6224B	P,T
Service Board**	Allows probing of RF Section interface connector during calibration or servicing	08620-60037	P,T
Extender Cable**		08620-60032	P,T
18 Pin Extender Board**		5060-2041	P,A,T

*P - Performance Test A = Adjustments T = Troubleshooting

**Part of Service Kit HP Part No. 08620-60030 (See Table 1-2).

SECTION II
INSTALLATION

2-1. INITIAL INSPECTION

2-2. Mechanical Check

2-3. The instrument was carefully inspected, both mechanically and electrically, prior to shipment. If external damage to the shipping carton is evident, ask the carrier's agent to be present when the instrument is unpacked. Check the instrument for external damage such as broken controls or connectors and dents or scratches on the panel surface. If damage is evident, refer to paragraph 2-6 for recommended claim procedure and paragraph 2-24 for repackaging information. If the shipping carton is not damaged, check the cushioning material and note any signs of severe stress as an indication of rough handling in transit. If the instrument appears undamaged, check for all supplied accessories, then perform the electrical check (paragraph 2-4).

2-4. Electrical Check

2-5. Check the electrical performance of the instrument as soon as possible after receipt by performing the Performance Test (Section IV). The Performance Test procedure compares the electrical performance to the specifications of Table 1-1. This test is also suitable for incoming quality control inspection. If the Sweep Oscillator does not perform within the specifications, refer to paragraph 2-6 for recommended claim procedure and paragraph 2-24 for repackaging information.

2-6. Claims for Damage

2-7. If physical damage is evident, or if the instrument does not meet specifications when received, notify the carrier and the nearest Hewlett-Packard Sales and Service Office. (See list at back of manual.) The sales and service office will arrange for repair or replacement without waiting for settlement of a claim with the carrier.

2-8. PREPARATION FOR USE

2-9. Power Requirements

2-10. The instrument requires a power source of 115 or 230 Vac ±10%, 50 to 400 Hz single phase. Power required is approximately 140 watts with RF Section and oscillator module(s) installed.

2-11. Selecting 115- or 230-Volt Operation

CAUTION

To avoid damage to the instrument, set the 115/230 volt switch for the line voltage to be used and insert the proper fuse before connecting the power cable.

2-12. A rear panel two-position slide switch permits instrument operation from either a 115- or 230-volt ac power source. To change the slide switch position:

a. Disconnect power cable from rear of instrument.

b. Slide plastic window covering fuse compartment to one side, exposing the fuse.

c. Pull outward on the FUSE PULL lever, exposing the 115/230 Vac slide switch.

d. Position the 115/230 slide switch so that the number opposite the slider corresponds to the line source voltage. Then insert the proper fuse.

2-13. Power Cable

2-14. To protect operating personnel, the National Electrical Manufacterers' Association (NEMA) recommends that instrument panels and cabinets be grounded. Accordingly, the instrument is equipped with a three-conductor power cable which grounds the panel and cabinet when plugged into an appropriate receptacle. The offset pin of the three-prong connector is the ground pin. To preserve the protection feature when operating the instrument from a two-contact outlet, use a three-prong to two-prong adapter (HP Part No. 1251-0048) and connect the pigtail on the adapter to ground.

2-15. Cooling

2-16. Clearances for ventilation should be three to four inches at the rear of the cabinet and two to three inches at the sides. The clearances provided by the plastic feet in bench stacking and

the filler strips in rack mounting are adequate for the top and bottom cabinet surfaces.

2-17. Bench Operation

2-18. The instrument cabinet has plastic feet and a foldaway tilt stand for convenience in bench operation. The tilt stand inclines the instrument for ease of reading the scale. The plastic feet provide clearance for air circulation and make the instrument self-aligning when stacked on other Hewlett-Packard full rack-width modular instruments.

2-19. Rack Mounting

2-20. The rack-mounting kit contains all hardware needed to adapt the instrument cabinet for installation in equipment racks having standard 19-inch spacing. Preparation for rack mounting is illustrated in Figure 2-1.

2-21. STORAGE AND SHIPMENT

2-22. Shipping Environment

2-23. The instrument should be kept free from dampness as much as possible to prevent voltage breakdown due to moisture.

2-24. Repackaging

2-25. Original Packaging. The same type containers and materials used in factory packaging can be obtained through the Hewlett-Packard sales and service offices listed at the back of this manual. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also mark the container FRAGILE to assure careful handling. In any correspondence refer to the instrument by model number and full serial number.

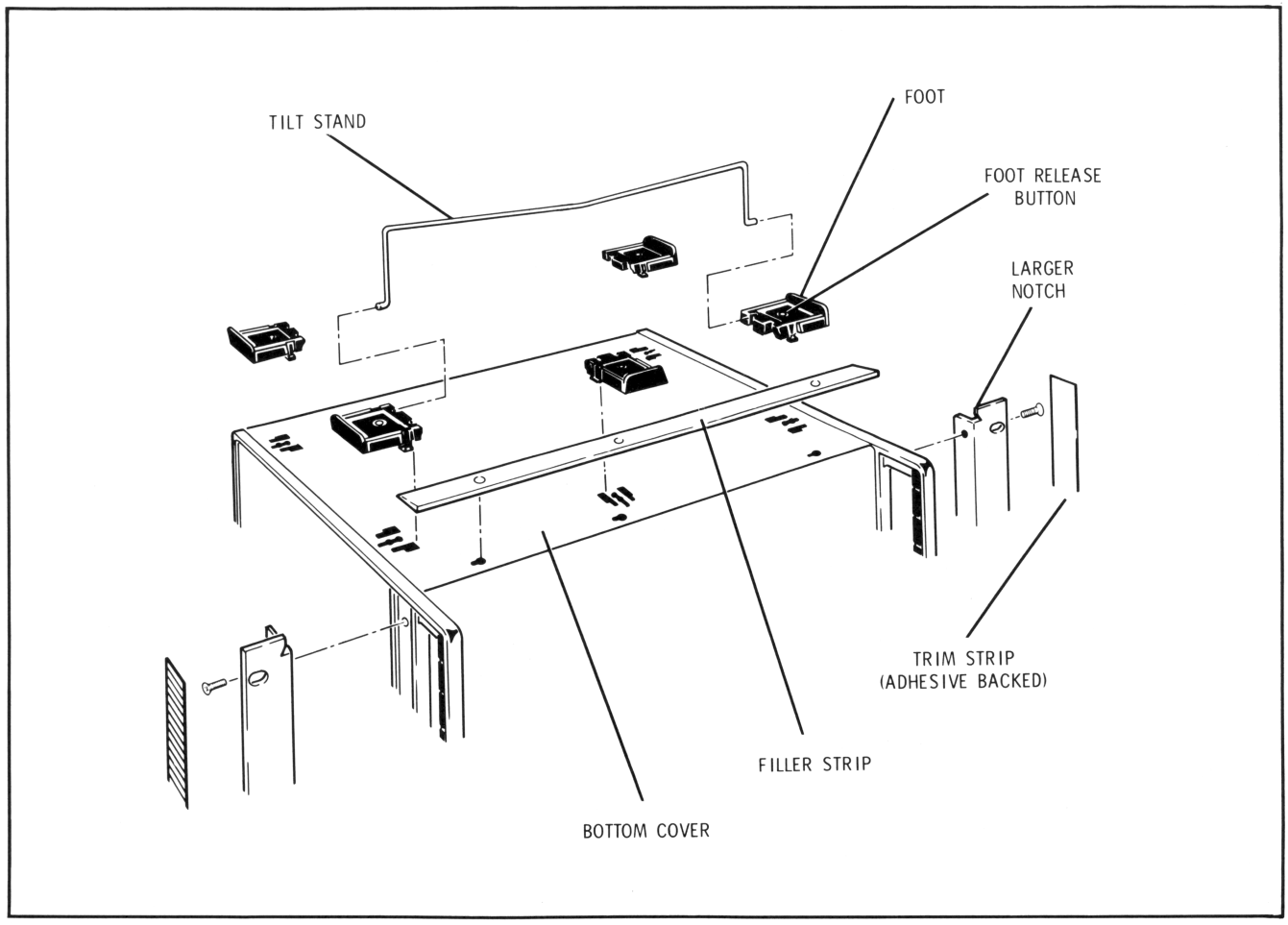


Figure 2-1. Preparation for Rack Mounting

2-26. Other Packaging Materials. The following general instructions should be used for repackaging with commercially available materials.

a. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard service office or center, attach a tag indicating the type of service required, return address, model number and full serial number).

b. Use a strong shipping container. A double-wall carton made of 350 pound test material is adequate.

c. Use enough shock-absorbing material (three to four inch layer) around all sides of the instrument to provide firm cushioning and prevent movement inside the container. Protect control panel with cardboard.

d. Seal the shipping container securely and mark it FRAGILE to assure careful handling.

e. In any correspondence, refer to instrument by model number and full serial number.

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This operating section explains the function of the controls and indicators of the Model 8620B Sweep Oscillator. It also describes typical operating modes in a measurement system. This section covers the typical operator maintenance such as fuse, indicator lamp, and fan filter replacement.

3-3. PANEL FEATURES

3-4. Front and rear panel features are described in Figures 3-1 and 3-2. Description numbers match the numbers on the illustration.

3-5. OPERATOR'S CHECK

3-6. The operator's check (Figure 3-3) is supplied to allow the operator to make a quick check of the main instrument functions prior to use. This operator's check assumes that an RF Section with oscillator modules is installed in the mainframe. If the correct indications are not obtained, trouble may be either in the mainframe or the RF Section. Perform the performance tests in Section IV to determine if the mainframe is working correctly.

3-7. OPERATING INSTRUCTIONS

3-8. Figures 3-4 through 3-6 show general operating procedures for the Model 8620B.

3-9. OPERATOR'S MAINTENANCE

3-10. Fuse Location and Replacement

3-11. There are five fuses in the Model 8620B Sweep Oscillator. The main ac line fuse is located at the back of the instrument next to the line cord jack. The ac line cord must be removed and the plastic cover moved to one side in order to gain access to the fuse compartment. The fuse may be removed by pulling the lever inside the fuse compartment. When 115 Vac supply source is used, the line fuse should be 2 ampere and when 230 Vac supply source is used, the line fuse should be 1 ampere. The other four fuses are inside the instrument. These fuses are plug-in types and are located on the A4 and A5 printed circuit board assemblies (2 each). Access to these fuses requires removing the instrument top cover and the A4, A5 assemblies. These fuses may be removed by pulling them straight out. See parts list in Section VI for fuse type and current rating.

3-12. Fan

3-13. The fan has an air filter attached to the rear panel for ease of cleaning or replacement. To service the air filter, remove the four screws holding the filter to the instrument rear panel and either replace it with the appropriate part listed in Section VI or clean it using a solution of warm water and soap.

3-14. Frequency Scale Installation

3-15. To install a frequency scale, proceed as follows:

a. Remove the 8620B top cover.

b. Depress the Band Lever until the desired drum position is accessible from inside the mainframe.

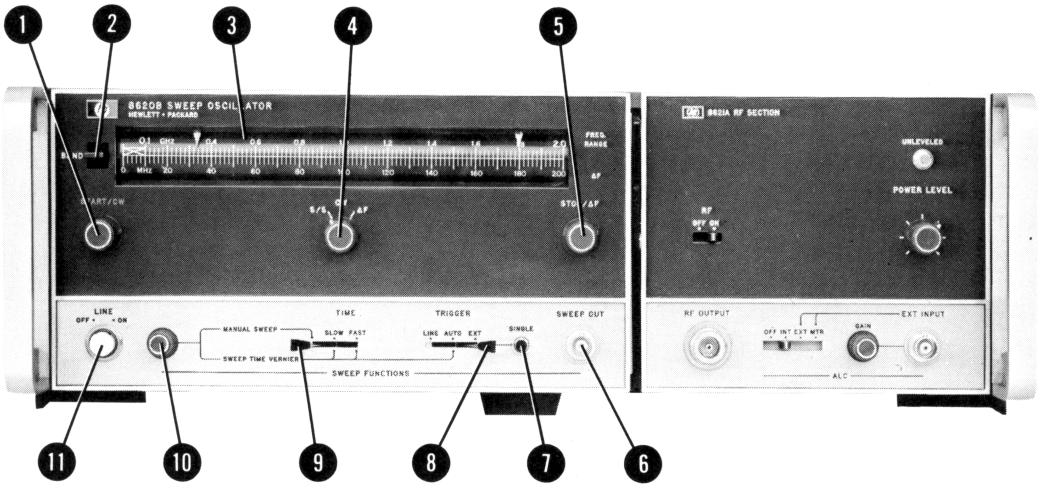
c. If applicable, remove the old frequency scale by exerting a pressure OUTWARD, away from the drum on the right-hand edge of the scale.

d. Insert the new frequency scale so that the key (1/2-inch protrusion) fits into the notch on the left-hand side of the drum. Then exert an inward pressure on the right-hand edge of the frequency scale to snap it in place.

3-16. Lamp Replacement

3-17. The front-panel lamp located in the LINE pushbutton switch is replaceable from the front. Figure 3-7 shows the replacement procedure.

FRONT PANEL FEATURES



1. START/CW Control. The green lettering near the START/CW control is color coded to the green pointer in the frequency scale window. In START/STOP operation, the green pointer indicates the start frequency (starting point of sweep). In CW operation the green pointer indicates the CW frequency.

2. BAND Lever. The BAND Lever may select any one of four bands (1, 2, 3, 4). The selected band can be identified by the number of notches visible on the left-hand side of the band-drum; 1 notch is Band 1, 2 notches is band 2, etc. Depressing the BAND Lever advances the band drum containing the frequency scales, as well as changing the position-sensing switches that activate the appropriate oscillator module position(s) in the plug-in RF Section.

3. Frequency Scale Window: The frequency range selected is displayed on the top portion of the scale, and the ΔF deviation on the bottom portion of the scale. A calibration scale is inserted in one position of the band-drum, for ease of calibration, but it is not essential to the calibration procedure.

NOTE

When a new oscillator module is added, a new scale should be installed using the procedure given in paragraph 3-14. Refer to the Operating and Service Manual of the RF Section being used for information concerning drum position and oscillator module position(s).

Figure 3-1. Front Panel Controls, Connectors and Indicators (Sheet 1 of 2)

FRONT PANEL FEATURES

4 S/S, CW, ΔF Function Switch. The Function Switch selects S/S (Start/Stop), CW, or ΔF mode of operation. The START/STOP mode may be manually or automatically swept between the green start pointer and the red STOP pointer. Normal sweep is from low to high frequency, however, by reversing the start and stop pointer positions, a high to low frequency sweep can be obtained. The CW mode generates a fixed frequency that is selected by the green CW pointer. During ΔF mode, the CW pointer setting is the center frequency. The red ΔF pointer selects the amount of frequency deviation (MHz) that sweeps symmetrically about the CW frequency.

5 STOP/ΔF Control. The red lettering near the STOP/ΔF control is color coded to the red pointer visible in the frequency scale window. In START/STOP operation the red pointer determines the stop-frequency (end of sweep). In ΔF operation the red pointer determines the amount of frequency deviation (MHz) that sweeps symmetrically about the CW center frequency (up to 10% of the band).

6 SWEEP OUT BNC Connector. In start-stop or ΔF modes of operation, the output from this connector is a linear ramp voltage from zero to 10 volts synchronous with the RF sweep signal. In CW mode of operation, the output is a fixed 10 Vdc.

7 In start/stop or ΔF modes of operation, this pushbutton control initiates a single sweep each time it is pressed momentarily. However, it operates only when the sweep TRIGGER switch is in the EXT position.

8 Sweep TRIGGER switch. In start/stop and ΔF modes of operation, this switch selects the source of sweep-trigger pulse. In EXT position, a trigger pulse may be applied through the rear-panel EXT TRIGGER connector or by pressing the front-panel SINGLE pushbutton momentarily. In AUTO position, the sweep trigger pulse is derived from an internal sweep generator and the system is free-running. In the LINE position the sweep is triggered by the AC power line sine wave peaks.

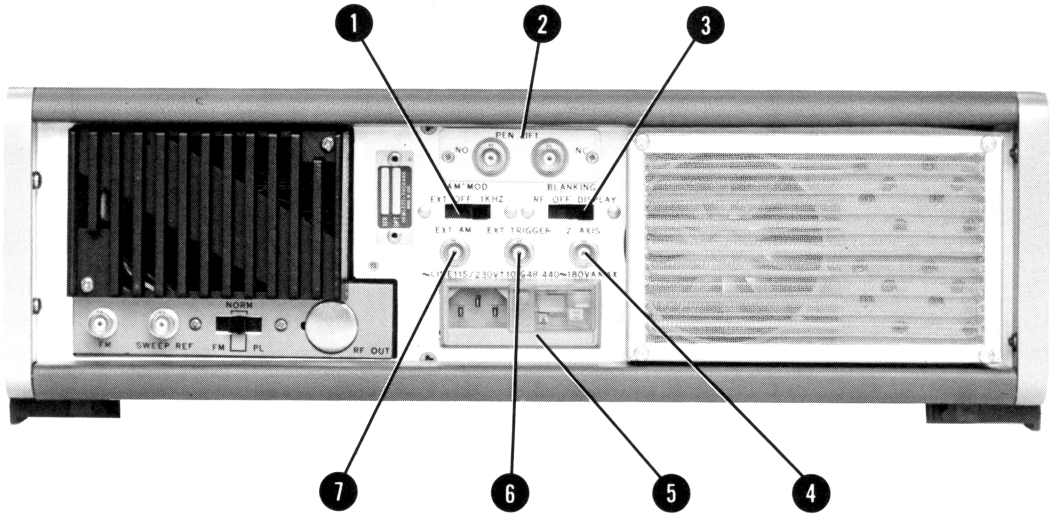
9 Sweep TIME switch. This switch selects the range of sweep time. With the sweep TIME switch set to FAST, the sweep time can be adjusted from 10 to 350 milliseconds per sweep. With the sweep TIME switch set to SLOW, the sweep time can be adjusted from 1 to 60 seconds per sweep. In MANUAL SWEEP position, the frequency band is manually swept with the MANUAL SWEEP control.

10 MANUAL SWEEP/SWEEP TIME VERNIER Control. During AUTO sweep (start/stop or ΔF) this control allows the sweep time to be adjusted through the range selected by the sweep TIME switch. During MANUAL sweep, this control allows manual sweep through the frequency range selected by the START and STOP controls or the ΔF control. The fully counterclockwise position selects the start frequency and the fully clockwise position selects the stop frequency.

11 LINE, ON-OFF Switch. This is the power switch. When power is applied to the instrument, the power lamp should light. Also, a black zig zag line on the side of the pushbutton indicates on and off position.

Figure 3-1. Front Panel Controls, Connectors and Indicators (Sheet 2 of 2)

REAR PANEL FEATURES



1. AM MOD switch. This switch selects the type of amplitude modulation. In the EXT position, an external modulation signal may be applied through the EXT AM connector below the switch. In OFF position, no amplitude modulation signal is applied to the RF output signal. In 1 kHz position, a 1 kHz internal oscillator modulates the RF output signal.

2. For use with X-Y graphic recorders. Penlift signals are available at two rear panel BNC connectors; NO penlift connector is open during sweep and closed during retrace; NC penlift connector is closed during sweep and open during retrace.

3. BLANKING switch. This switch selects the type of blanking. In the RF position, the RF signal is turned off during the retrace portion of the sweep. This mode of blanking should not be selected when the sweeper is used with a phase lock system such as the Model 8410A/8411A Network Analyzer. For phase lock operation, use either OFF or DISPLAY position. In the OFF position of the slide switch, no blanking is selected. In the DISPLAY position, blanking is applied to the Z-AXIS BNC connector below the slide switch. This is used to blank the display instrument during retrace.

4. Z-AXIS connector. This BNC connector provides the Z-axis modulation to the display instrument. Blanking signal is a rectangular pulse of approximately +6V into 10K ohms and is selected when the rear panel BLANKING switch is in the DISPLAY position.

Figure 3-2. Rear Panel Controls and Connectors

REAR PANEL FEATURES

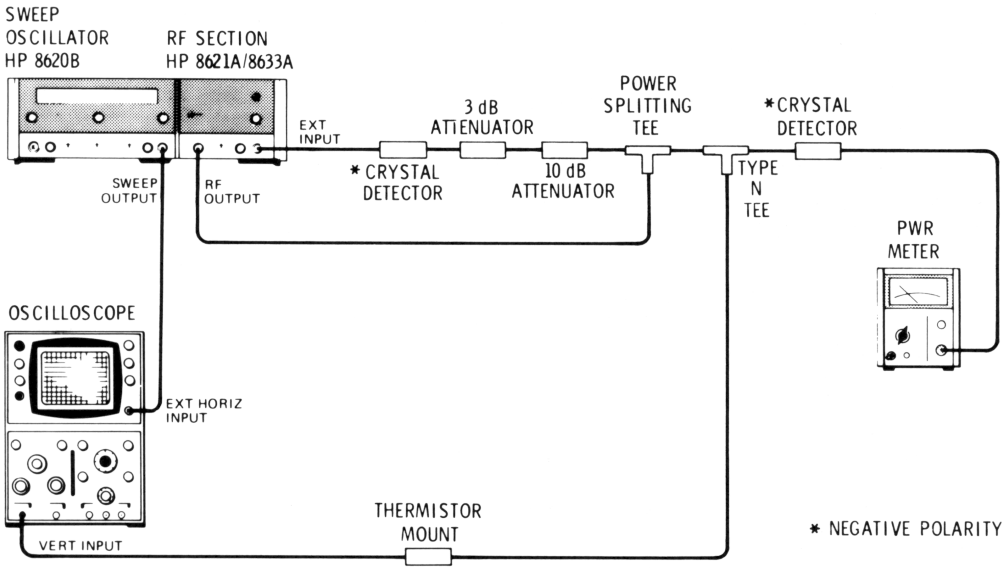
5 Power Input Switch and Fuse. The input power switch allows selection of either 115 or 230 Vac operation. To change the switch position, the power cable must be disconnected from the rear of the instrument. This allows the plastic window covering the fuse compartment to slide to one side, exposing the fuse. To either change fuses or to change the 115/230 Vac switch position, pull outward on the lever in the fuse compartment.

6 EXT TRIGGER connector. This BNC connector is the input for a positive external trigger pulse. This input is selected when the front panel sweep TRIGGER slide switch is in the EXT position. Trigger signal must be greater than +2 Vdc, wider than 0.5 μsec and not greater than 1 MHz in frequency.

7 EXT AM connector. This BNC connector is the input for an external amplitude modulation signal. This input is selected when the rear panel AM MOD slide switch is in the EXT position.

Figure 3-2. Rear Panel Controls and Connectors (Sheet 2 of 2)

OPERATOR'S CHECK



PROCEDURE:

1. Connect equipment as shown in test setup.

2. Set the 8620B/8621A controls as follows:

8620B

BAND	Frequency band desired
START/CW	Left-hand edge of band scale
STOP/ΔF	Right-hand edge of band scale
Function	S/S (START/STOP)
TIME	FAST
TRIGGER	AUTO
AM MOD (rear panel)	OFF
BLANKING (rear panel)	OFF

8621A

RF	ON
ALC	OFF
POWER LEVEL	Fully counterclockwise (unleveled lamp should be lit)
ALC GAIN	Fully counterclockwise

3. Depress LINE pushbutton switch to turn on instrument and pushbutton lamp should light.

Figure 3-3. Operator's Check (Sheet 1 of 2)

OPERATOR'S CHECK

SWEEP CHECK

4. Set oscilloscope for a vertical sensitivity of approximately 50 mV/div and establish a zero volt base line near the top of the CRT face.

5. Press BAND lever to advance the band drum. Check that each oscillator installed in the RF Section is sweeping correctly when selected. This is indicated by a continuous signal level line below the zero volt base line on the oscilloscope.

BLANKING CHECK

6. Set rear panel BLANKING switch to RF. The oscilloscope should display two different signal levels (sweep and blanking traces).

LEVELING CHECK

7. Set 8621A polarity switch to negative to match the crystal detector output. The polarity switch is located on top of the switch board, just inside the 8621A front panel, and requires partial removal of the 8621A to gain access to the switch.

8. Adjust 8621A ALC GAIN and POWER LEVEL controls to obtain the highest power meter indication and still have the 8621A UNLEVELED light not lit. (If oscillations appear on trace, adjust 8621A ALC GAIN and POWER LEVEL controls counterclockwise as necessary.)

MODULATION CHECK

9. Set the 8620B controls as follows:

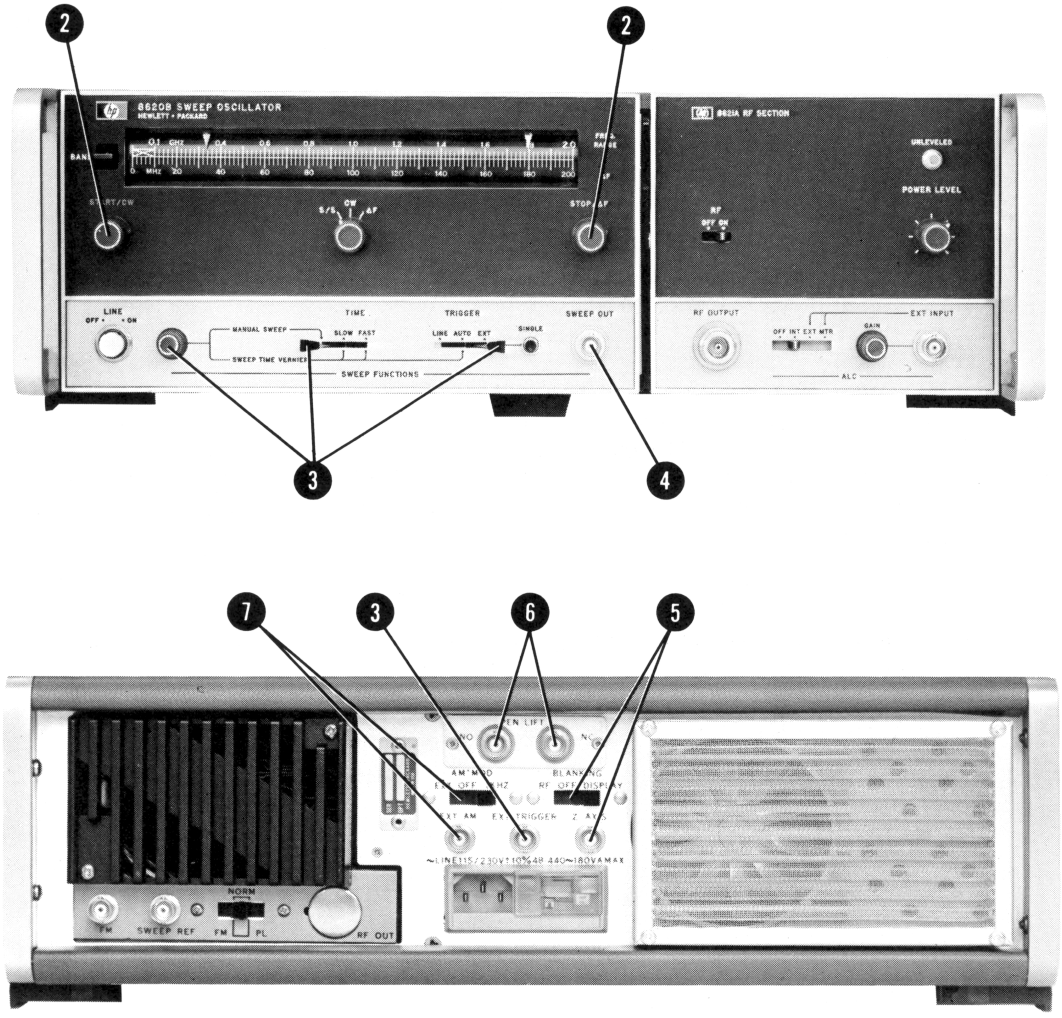
START/CW	Middle of band scale selected
Function	CW
BLANKING (rear panel)	OFF
AM MOD (rear panel)	1 kHz

10. Set oscilloscope for internal sweep (1 msec/div). Oscilloscope display should appear as a 1 kHz square wave (see Figure 4-2).

This completes the operator's check. Detailed Performance Testing procedures are given in Section IV.

Figure 3-3. Operator's Check (Sheet 2 of 2)

START-STOP MODE OF OPERATION



NOTE

The number callouts correspond to the procedural step(s) in which the control is used.

Figure 3-4. Start-Stop Mode of Operation (Sheet 1 of 3)

START-STOP MODE OF OPERATION

PROCEDURE:

1. Set the 8620B controls as follows:

BAND	Frequency band desired
START/CW	Left-hand edge of band scale
STOP/ΔF	Right-hand edge of band scale
Function	S/S (Start/Stop)
TRIGGER	AUTO
TIME	FAST
SWEEP TIME VERNIER	Fully clockwise
LINE	ON

NOTE

Power level is determined by the RF Section being used. Refer to the RF Section instruction manual. Frequency band is determined by the Oscillator module in the RF Section. Refer to the Oscillator module instruction manual.

2. The sweep range is determined by the START/CW control (green pointer) and the STOP/ΔF control (red pointer) settings. These controls are independently adjustable over 100% of the frequency band. Normal Start/Stop sweep operation produces a sweep that begins at the START/CW setting and ends at the STOP/ΔF setting. The frequency band may be swept either from low to high frequency or from high to low frequency, depending on where the START/CW and STOP/ΔF controls are set.

NOTE

The ΔF mode of operation is recommended for sweeps that are less than 10% of the frequency band (see Figure 3-6).

3. The start/stop sweep may be swept automatically, singly, or manually.

   a. For automatic sweep operation, set the sweep TRIGGER switch to either AUTO or LINE positions. In AUTO position, the sweep generator is free-running and causes an automatic repetitive sweep. The sweep TIME switch should be set for the desired position (FAST or SLOW) and the SWEEP TIME VERNIER control adjusted for the desired sweep time. In the FAST position, the sweep time can be adjusted from approximately 10 to 350 milliseconds per sweep. In the SLOW position, the sweep time can be adjusted from approximately one to 60 seconds per sweep. With the sweep TRIGGER switch set to LINE position, the sweep generator is triggered by the ac power line sine wave peaks.

   b. For single sweep operation, set the sweep TRIGGER switch to EXT position. A single sweep can then be initiated each time a positive external-trigger pulse is applied through the rear-panel EXT TRIGGER connector* or when the front-panel SINGLE pushbutton is pressed momentarily.

*Repetition rate of the external trigger must be less than 1 MHz. Sweep time will be dependent on where the sweep TIME and SWEEP TIME VERNIER controls are set.

Figure 3-4. Start-Stop Mode of Operation (Sheet 2 of 3)

START-STOP MODE OF OPERATION

c. For manual sweep operation, set the sweep TRIGGER switch to AUTO position and sweep TIME switch to MANUAL SWEEP position. Manually sweep the band by starting with the MANUAL SWEEP control fully counterclockwise (start frequency setting) and rotating it fully clockwise (stop frequency setting).

4. In START/STOP sweep operation, the SWEEP OUT connector supplies a ramp voltage of 0 to +10 Vdc. This ramp is normally used to sweep the X-axis of various display units.

5. During retrace, blanking may be applied to either the RF output or supplied to the rear-panel Z-AXIS connector.

   a. With the BLANKING switch set to the RF position, a blanking signal of approximately 2 volts is applied to the appropriate oscillator module in the plug-in RF Section, causing the RF output to go off. Refer to the RF Section instruction manual for information regarding ON/OFF ratio.

   b. With the BLANKING switch set to the DISPLAY position, a blanking signal of approximately 6 volts is supplied to the rear-panel Z-AXIS connector. This z-axis blanking signal is normally used to blank the sweep retrace on a CRT display.

6. Penlift signals are generated with the TIME switch set to the SLOW position. During sweep, the NO (normally open) rear-panel connector has its center conductor open and the NC (normally closed) rear-panel connector has its center conductor closed to the penlift common (outer case of connector). During retrace, the reverse is true. The NO connector has its center conductor closed to the penlift common and the NC connector has its center conductor open.

7. In START/STOP sweep operation, the swept frequency may be modulated with either an AM or FM input signal.

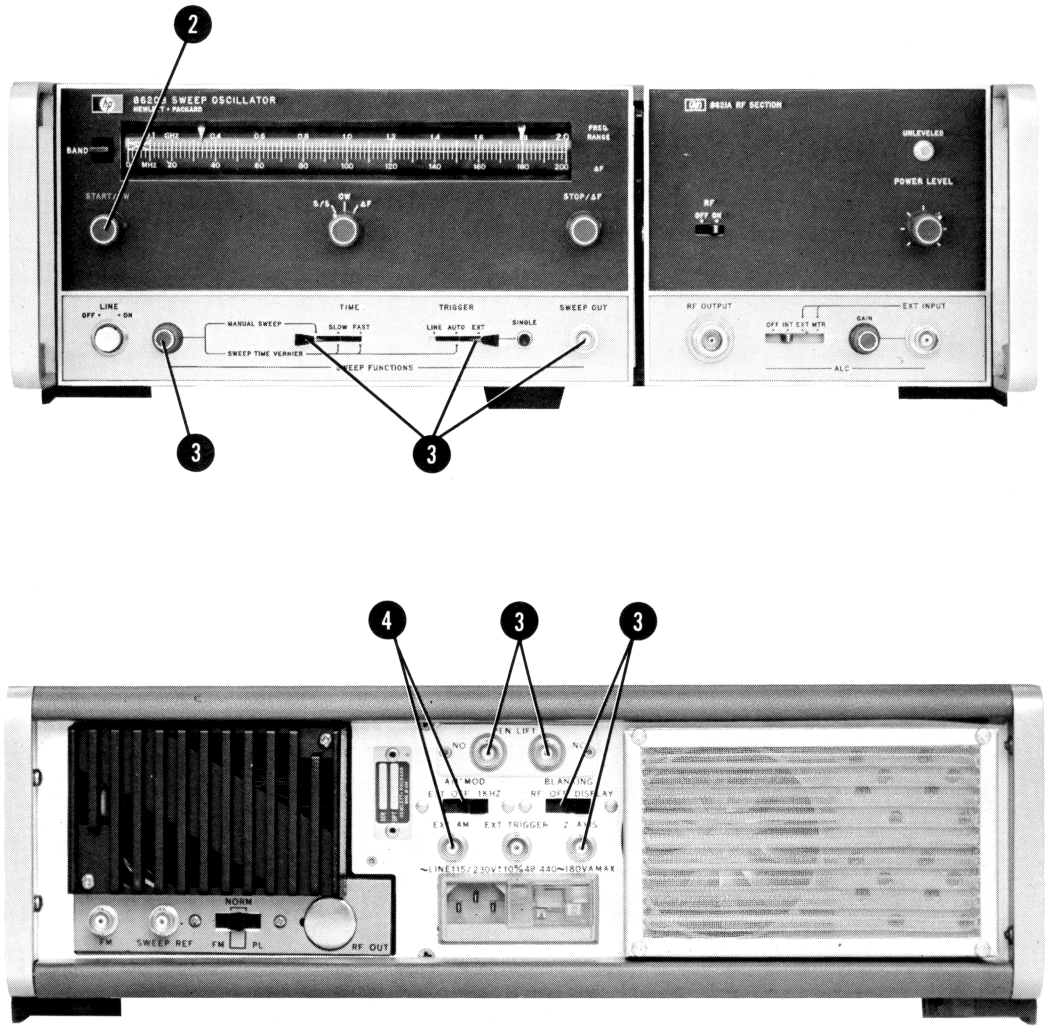
   a. To AM modulate the output frequency, set the rear-panel AM MOD switch to either EXT or 1 kHz position. In EXT position, a modulation signal may be applied from an external source through the rear-panel EXT AM connector. In 1 kHz position, a 1 kHz internal oscillator modulates the output frequency.

   b. FM modulation is a function of the oscillator module being used in the RF Section. Refer to the RF Section instruction manual.

   c. The output may also be modulated simultaneously with both AM and FM signals.

Figure 3-4. Start-Stop Mode of Operation (Sheet 3 of 3)

CW MODE OF OPERATION



NOTE

The number callouts correspond to the procedural step(s) in which the control is used.

Figure 3-5. CW Mode of Operation (Sheet 1 of 2)

CW MODE OF OPERATION (cont'd)

PROCEDURE:

1. Set the 8620B controls as follows:

BAND	Frequency band desired
Function	CW
START/CW	Center of band scale
AM MOD (rear panel)	OFF
BLANKING (rear panel)	OFF
LINE	ON

NOTE

Power level is determined by the RF Section being used. Refer to the RF Section instruction manual. Frequency band is determined by the oscillator module in the RF Section. Refer to the oscillator module instruction manual.

2. The CW frequency is determined by the START/CW control (green pointer) setting. This control is adjustable over 100% of the frequency band.

3. In CW operation neither sweep or retrace occur. This results in the following:

   a. SWEEP FUNCTION controls are inoperative.

   b. Output level of SWEEP OUT connector goes to 10 volts and does not change, regardless of the START/CW control setting.

   c. No blanking signals (RF or DISPLAY) are generated.

   d. No Penlift drive signals are generated. The rear-panel NO PENLIFT connector remains open and the NC PENLIFT connector remains shorted (center conductor shorted to outer conductor).

4. In CW operation, the CW frequency may be modulated with either an AM or FM input signal.

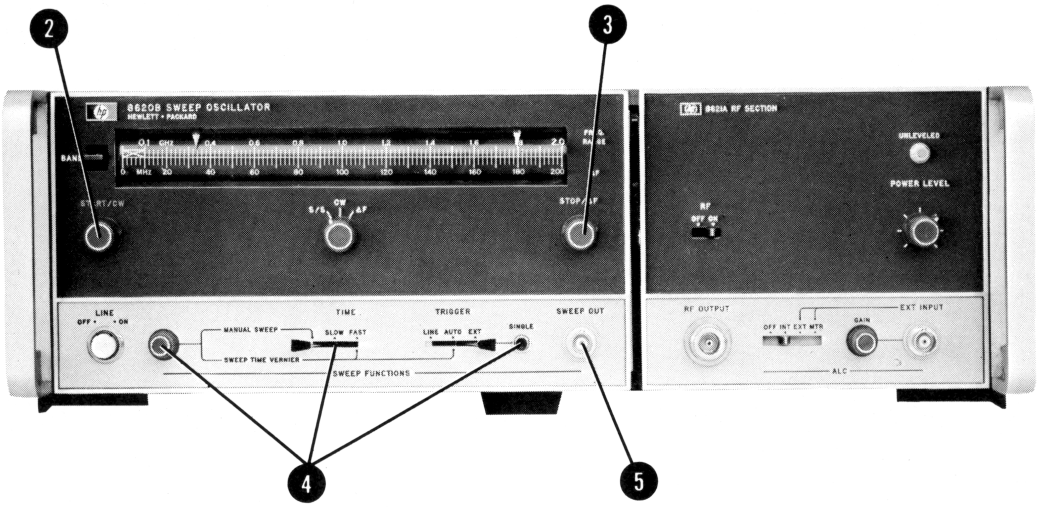
   a. To AM modulate the CW frequency, set the rear-panel AM MOD switch to either EXT or 1 kHz position. In EXT position, a modulation signal may be applied from an external source through the rear-panel EXT AM connector. In 1 kHz position, a 1 kHz internal oscillator modulates the output frequency.

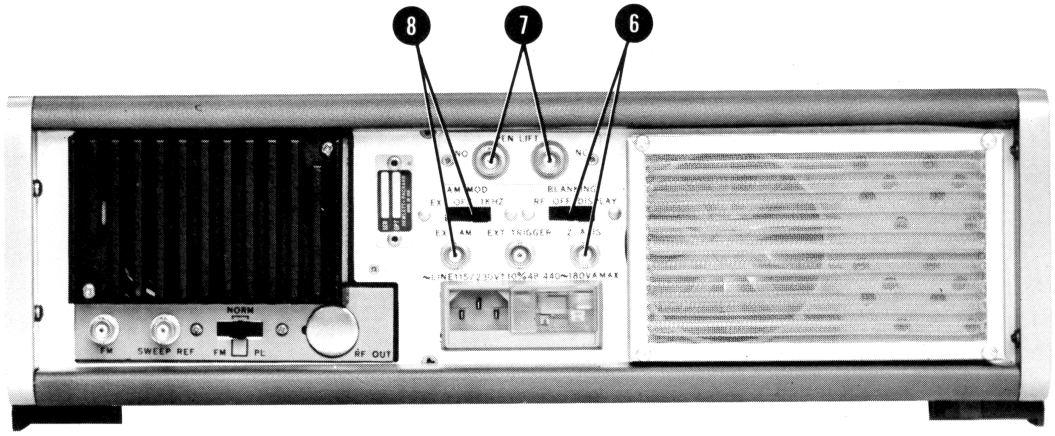
   b. FM modulation is a function of the oscillator module used in the RF Section. Refer to the RF Section instruction manual.

   c. The output frequency may be modulated simultaneously with both AM and FM signals.

Figure 3-5. CW Mode of Operation (Sheet 2 of 2)

ΔF MODE OF OPERATION





NOTE

The number callouts correspond to the procedural step(s) in which the control is used.

Figure 3-6. ΔF Mode of Operation (Sheet 1 of 3)

ΔF MODE OF OPERATION (cont'd)

PROCEDURE:

1. Set the 8620B controls as follows:

BAND	Frequency band desired
START/CW	Center frequency desired
STOP/ΔF	Amount of deviation (MHz) desired
Function	ΔF
AM MOD (rear panel)	OFF
BLANKING (rear panel)	OFF
LINE	On

NOTE

Power level is determined by the RF Section being used. Refer to the RF Section instruction manual. Frequency band is determined by the oscillator module plugged into the RF Section. Refer to the oscillator module instruction manual.

2. The START/CW control setting (green pointer) selects the CW frequency (center frequency) and is adjustable over 100% of the entire frequency band.

3. The STOP/ΔF control (red pointer) selects the total amount of frequency deviation (MHz) that is swept about the center frequency and is adjustable from zero to 10% of the frequency band. Total deviation can be read directly off the calibrated band scale. The sweep is symmetrical about the center frequency and goes from low to high frequency.

4. The ΔF sweep may be swept automatically, singly, or manually.

   a. For automatic sweep operation, set the sweep TRIGGER switch to either AUTO or LINE positions. In AUTO position the sweep generator is free-running and causes an automatic repetitive sweep. The sweep TIME switch should be set for the desired position (FAST or SLOW) and the SWEEP TIME VERNIER control adjusted for the desired sweep time. In the FAST position, the sweep time can be adjusted from approximately 10 to 350 milliseconds per sweep. In the SLOW position, the sweep time can be adjusted from approximately one to 60 seconds per sweep. With the sweep TRIGGER switch set to LINE position, the sweep generator is triggered by the ac power line sine wave peaks.

   b. For single sweep operation, set the sweep TRIGGER switch to EXT position. A single sweep can then be initiated each time a positive external-trigger pulse is applied through the rear-panel EXT TRIGGER connector* or when the front-panel SINGLE pushbutton is pressed momentarily.

   c. For manual sweep operation, set the sweep TRIGGER switch to AUTO position and sweep TIME switch to MANUAL SWEEP position. Manually sweep the band by starting with the MANUAL SWEEP control fully counterclockwise.

$$\left(\text{Center frequency} - \frac{\text{frequency deviation (MHz)}}{2}\right)$$ and rotating it to fully cw position

$$\left(\text{Center frequency} + \frac{\text{frequency deviation (MHz)}}{2}\right).$$

*Repetition rate of the external trigger should be less than 1 MHz. Sweep time will be dependent on where the sweep TIME and SWEEP TIME VERNIER ceontrols are set.

Figure 3-6. ΔF Mode of Operation (Sheet 2 of 3)

ΔF MODE OF OPERATION (cont'd)

5. During ΔF operation the SWEEP OUT connector supplies a rising linear ramp voltage (low to high frequency) of 0 to 10V. This ramp voltage is normally used to sweep the X-axis of various display units.

6. During retrace, blanking may be applied to either the RF output or supplied to the rear-panel Z-AXIS connector.

   a. With the BLANKING switch set to the RF position, a blanking signal of approximately 2 volts is applied to the appropriate oscillator module in the plug-in RF Section, causing the RF output to go off. Refer to the RF Section instruction manual for information regarding ON/OFF ratio.

   b. With the BLANKING switch set to the DISPLAY position, a blanking signal of approximately 6 volts is supplied to the rear-panel Z-AXIS connector. This z-axis blanking signal is normally used to blank the sweep retrace on a CRT display.

7. Penlift signals are generated with the TIME switch set to the SLOW position. During sweep, the NO (normally open) rear-panel connector has its center conductor open and the NC (normally closed) rear-panel connector has its center conductor closed to the penlift common (outer case of connector). During retrace, the reverse is true. The NO connector has its center conductor closed to the penlift common and the NC connector has its center conductor open.

8. During ΔF operation, the swept frequency may be modulated with either an AM or FM input signal.

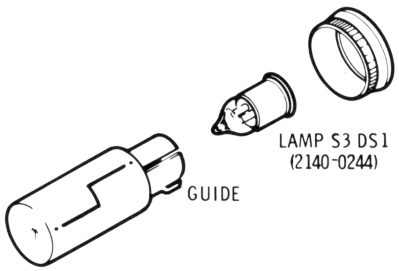
   a. To AM modulate the output frequency, set the rear-panel AM MOD switch to either EXT or 1 kHz position. In EXT position, a modulation signal may be applied from an external source through the rear-panel EXT AM connector. In 1 kHz position, a 1 kHz internal oscillator modulates the output frequency.

   b. FM modulation is a function of the oscillator module in the RF Section. Refer to the RF Section instruction manual.

   c. The output frequency may also be modulated simultaneously with both AM and FM signals.

Figure 3-6. ΔF Mode of Operation (Sheet 3 of 3)

LINE SWITCH PUSHBUTTON LIGHT
S3 (1301-1395)



PROCEDURE:

a. Remove LINE pushbutton by pulling it straight back.

b. Replace faulty lamp.

c. Realign LINE pushbutton guide with notch in LINE switch receptacle and slide it back in place.

d. Press LINE pushbutton several times and it should remain in place. If not, repeat step c.

Figure 3.7. Lamp Replacement

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

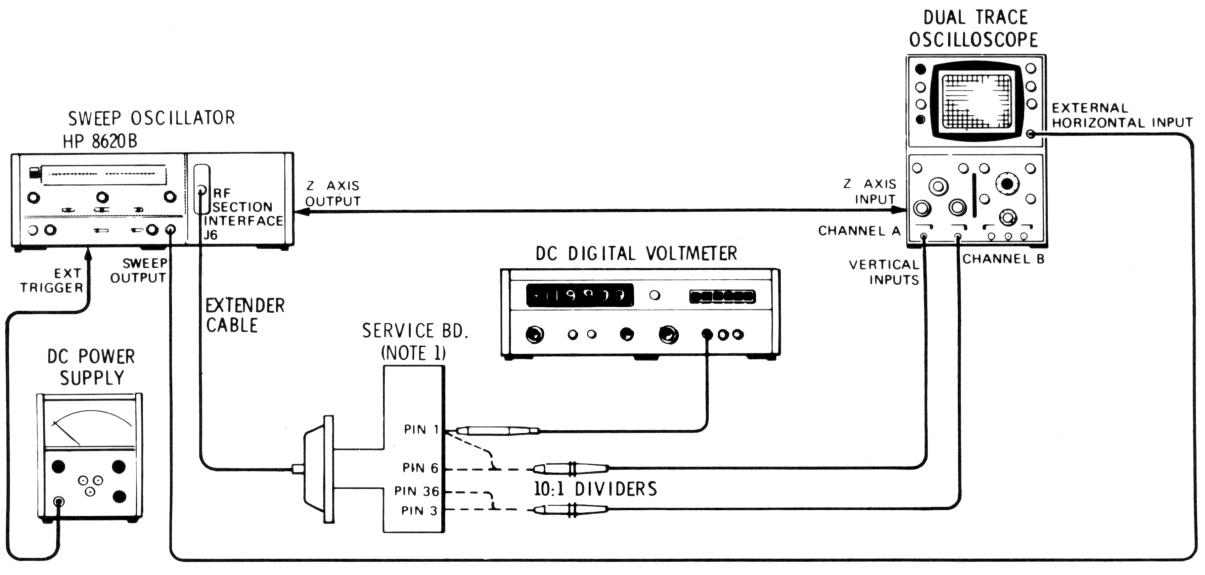
4-2. This section contains tests to check overall performance of the instrument. They check that the instrument meets the specifications listed in Table 1-1. These tests may be used for incoming inspection, after repair of the instrument, after performing the adjustment procedure, or for periodic evaluation. If only a simple check of the instrument operation is needed, the operator's check in Section III may be used. The performance test procedures must be performed in the sequence given, since some procedures rely on satisfactory test results in forgoing steps. If a test measurement is slightly out of tolerance, go to Section V and perform adjustment procedures. If a function fails to operate, go to Section VIII and perform troubleshooting.

4-3. EQUIPMENT REQUIRED

4-4. A complete list of equipment required to perform the performance tests is given in Table 1-3. If the recommended equipment in the list is not available, a substitute may be used if it meets or exceeds the critical specifications listed in Table 1-3.

4-5. TEST RECORD

4-6. Table 4-1 is a test record form that is provided to record results from the performance tests. The table is keyed to the paragraph numbers and test titles in the procedures.



Notes

1. For test equipment ground, use pin 35 on Service Board.
2. Recommended HP equipment is as follows:

Oscilloscope with 10:1 probe	HP 180A/1801A/1820A
DC Digital Voltmeter	HP 3460B
Extender Cable	HP 0860-60032
Service Board	HP 08620-60037
DC Power Supply	HP 6224B

Figure 4-1. Test Setup for Performance Test

PERFORMANCE TESTS

Note

To avoid parallax when setting a pointer to a graticule mark, view the pointer and scale directly from the front of the instrument panel.

In the following procedures, use RF Section interface connector pin J6-35 for ground return in all test setups.

4-7. START/STOP Sweep Mode

Specification:

START-STOP Sweep: Sweeps from START to STOP frequency setting. Selected by function switch at the center of the front panel.

Range: Both START or STOP settings continuously and independently adjustable over the entire frequency range; can be set to sweep either up or down in frequency.

End-point Accuracy: Same as RF unit frequency accuracy.

Description:

The manual sweep mode is checked at the center and end points for correct calibration. Automatic sweep mode is then selected and the sweep speed is adjusted for slowest trace. The end point voltages are checked with DVM to determine if they are within tolerance.

Procedure:

1. Connect equipment as shown in Figure 4-1. Set oscilloscope for dc coupled external horizontal sweep. Connect DVM and oscilloscope channel A to Pin 1 on Service board (tuning voltage output).

2. Set the 8620B controls as follows:

BAND	Frequency Band Desired	Function	S/S (Start/Stop)
START/CW	Left-hand edge of band scale	TRIGGER	AUTO
STOP/ΔF	Right-hand edge of band scale	TIME	MANUAL SWEEP
		SWEEP TIME VERNIER	Fully counterclockwise
		LINE	ON

Note

Power level is determined by the RF Section being used. Refer to RF Section instruction manual. Frequency Band is determined by the Oscillator module in the RF Section. Refer to oscillator module instruction manual.

Manual Sweep Check

3. DVM should indicate 0.00 Vdc ±0.05 Vdc. Set green START/CW pointer to center graticule and DVM should indicate 5.00 Vdc ±0.05 Vdc. Set green START/CW pointer to right hand edge graticule and DVM should indicate 10.00 Vdc ±0.05 Vdc.

4. Set MANUAL SWEEP control to fully clockwise position. Set red STOP/ΔF pointer to left-hand edge graticule and DVM should indicate 0.00 Vdc ±0.05 Vdc. Set red STOP/ΔF pointer to center graticule and DVM should indicate 5.00 Vdc ±0.05 Vdc. Set red STOP/ΔF pointer to right-hand edge graticule and DVM should indicate 10.00 Vdc ±0.05 Vdc.

PERFORMANCE TESTS

4-7. START/STOP Sweep Mode (Cont)

Automatic Sweep Check

5. Set green START/CW pointer to left-hand edge graticule and set red STOP/ΔF pointer to right-hand edge graticule. Set sweep TIME switch to SLOW position and set SWEEP TIME VERNIER control fully counterclockwise. Oscilloscope should display a slow rising, linear ramp trace. The ramp end points should be 0.00 Vdc ±0.05 Vdc and 10.00 Vdc ±0.05 Vdc as indicated on the DVM.

4-8. Single and External Triggered Sweep

Specification:

Triggered Sweep: Sweep is actuated by front panel pushbutton switch, or by externally-applied signal ≥+2 volts peak, >1/2 μs pulse width, and <1.0 MHz repetition rate. (Signal applied to external trigger input on the rear panel.)

Description:

The single and external sweep modes are checked at the end points for correct calibration. The sweep time is set for the slowest sweep speed and the end point voltages measured with a DVM to determine if they are within tolerance.

Procedure:

1. Connect equipment as shown in Figure 4-1.

2. Set 8620B controls as follows:

BAND	Frequency Band Desired	TRIGGER	EXT
START/CW	Left-hand edge of band scale	TIME	SLOW
STOP/ΔF	Right-hand edge of band scale	SWEEP TIME VERNIER	Fully counterclockwise
Function	S/S	AM MOD (rear-panel)	OFF
		BLANKING (rear-panel)	OFF
		LINE	ON

Single Sweep Check

3. Verify that the DVM and oscilloscope CHANNEL A are connected to pin 1 on the service board (tuning voltage output). The DVM should indicate 0.00 Vdc ±0.05 Vdc (bottom of ramp).

4. Press front-panel SINGLE pushbutton momentarily. A single sweep should occur. The DVM should indicate +10.00 Vdc ±0.05 Vdc at the top of the ramp.

External Sweep Check

5. Verify that DVM and oscilloscope are connected to pin 1 on the service board (tuning voltage output). The DVM should indicate 0.00 Vdc ±0.05 Vdc (bottom of ramp).

6. Connect +2 Vdc from an external power supply to the rear panel EXT TRIGGER connector. A single sweep should occur. The DVM should indicate +10.00 Vdc ±0.05 Vdc at the top of the ramp.

PERFORMANCE TESTS

4-9. ΔF Sweep Mode

Specification:

ΔF Sweep: Sweeps upward in frequency, centered on START/CW setting. Selected by Function switch at center of the front panel.

Width: Continuously adjustable from zero to ten percent of usable frequency band. Width controlled by STOP/ΔF control. Width dial-scale calibrated directly in MHz.

Width Accuracy: ±1% of maximum ΔF (±2% of ΔF being swept).

Description:

The START/CW control is set to the left-hand edge of the band scale, 0.00 Vdc indication on the DVM. The ΔF ramp voltage end points are then checked to determine if they are within tolerance.

Procedure:

1. Connect equipment as shown in Figure 4-1.

2. Set 8620B controls as follows:

BAND	Frequency Band Desired	TRIGGER	EXT
Function	CW	TIME	MANUAL SWEEP
START/CW	Left-hand edge of band scale	MANUAL SWEEP	Fully counterclockwise
STOP/ΔF	Right-hand edge of band scale	AM MOD (rear panel)	OFF
		BLANKING (rear panel)	OFF
		LINE	ON

3. Verify that DVM and oscilloscope channel A are connected to pin 1 of the service board (tuning voltage output). Set oscilloscope for internal horizontal sweep.

4. Adjust START/CW control to obtain a DVM indication of 0.000 Vdc ±0.001 Vdc.

5. Set function switch to ΔF position and set red pointer to right-hand edge graticule.

6. Adjust MANUAL sweep control fully counterclockwise and DVM should indicate −0.500 Vdc ±0.005 Vdc.

7. Adjust MANUAL sweep control fully clockwise and DVM should indicate +0.500 Vdc ±0.005 Vdc.

4-10. CW Mode

Specification:

CW Operation: Single-frequency RF output selected by function switch at center of the front panel. Frequency controlled by START/CW knob.

Accuracy: Refer to RF Unit specification.

Description:

The CW linear output voltage is checked at the left-hand scale edge graticule, at the scale center, and at the right-hand edge graticule to determine if it is within tolerance.

PERFORMANCE TESTS

4-10. CW Mode (Cont)

Procedure:

1. Connect equipment as shown in Figure 4-1.

2. Set the 8620B controls as follows:

BAND	Frequency Band Desired	Function	CW
START/CW	Left-hand edge of band scale	LINE	ON
		AM MOD (rear panel)	OFF
		BLANKING (rear panel)	OFF

3. Verify that the DVM is connected to pin 1 of the service board. DVM should indicate 0.00 Vdc ±0.05 Vdc.

4. Set START/CW to center of band scale and DVM should indicate +5.00 Vdc ±0.05 Vdc.

5. Set START/CW to right-hand edge of band scale and DVM should indicate +10.00 Vdc ±0.05 Vdc.

4-11. Amplitude Modulation

Specification:

Internal AM: 1 kHz square wave modulation on all sweep times. On/off ratio greater than 20 dB at rated output.

Description:

Internal 1 kHz square wave moduation is selected and the output to the RF Section is monitored on an oscilloscope. (On/off ratio not checked since this is a function of the RF Section/Oscillator module combination.)

Procedure:

1. Connect equipment as shown in Figure 4-1.

2. Set the 8620B controls as follows:

BAND	Frequency Band Desired
START/CW	Frequency desired
Function	CW
LINE	ON
AM MOD (rear panel)	OFF
BLANKING (rear panel)	OFF

3. Verify that oscilloscope channel A is connected to pin 6 of the Service board (switched internal 1 kHz). Set oscilloscope for internal horizontal sweep.

4. Set rear-panel AM MOD switch to 1 kHz position. A 1 kHz waveform should appear on oscilloscope as shown in Figure 4-2.

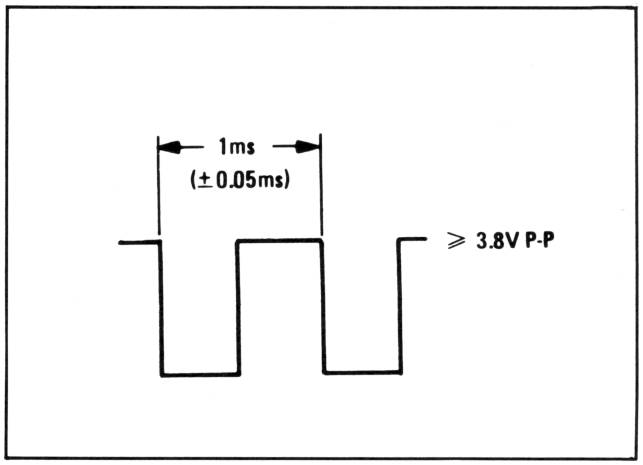


Figure 4-2. 1 kHz Internal Modulation Signal at J6-6

PERFORMANCE TESTS

4-12. Blanking Output

Specification:

Blanking: With blanking switch enabled, RF automatically turned off during retrace and turned on after completion of retrace. On automatic sweeps, RF is on long enough before sweep starts to stabilize external circuits and equipment whose response is compatible with the selected sweep rate.

Blanking Output: Direct coupled rectangular pulse approximately +6V coincident with RF blanking available from Z-axis output jack in the rear. Source impedance approximately 1000 ohms.

Description:

Display blanking is checked by observing the output ramp voltage waveform with blanking applied to the Z-axis of the oscilloscope. RF blanking is observed by displaying both the output ramp voltage and the ALC blanking voltage together on oscilloscope and noting timing between signals.

Procedure:

1. Connect equipment as shown in Figure 4-1.

2. Set 8620B controls as follows:

TRIGGER	AUTO
TIME	FAST
BAND	Frequency Band Desired
START/CW	Left-hand edge of band scale
STOP/ΔF	Right-hand edge of band scale
Function	S/S
AM MOD (rear panel)	OFF
BLANKING (rear Panel)	OFF
LINE	ON
SWEEP TIME VERNIER	Fully clockwise

Display Blanking Check

3. Verify that rear panel Z-AXIS connector output is connected to oscilloscope Z-AXIS input. Connect oscilloscope channel A probe to pin 1 of service board (tuning voltage output) and connect channel B probe to pin 3 (ALC blanking signal). Set oscilloscope for internal horizontal sweep.

4. Set rear panel BLANKING switch to DISPLAY position. The blanked output trace on channel A should be as shown in Figure 4-3.

RF Blanking Check

5. Set rear-panel BLANKING switch to RF position. Set oscilloscope to chop channel A and channel B and display a dual trace. The resulting waveform on the oscilloscope should be as shown in Figure 4-4.

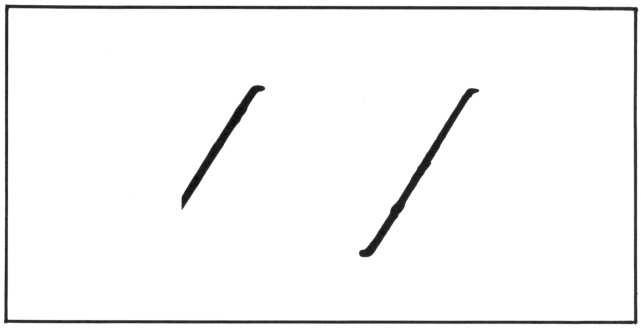


Figure 4-3. Blanked Ramp at J6-1

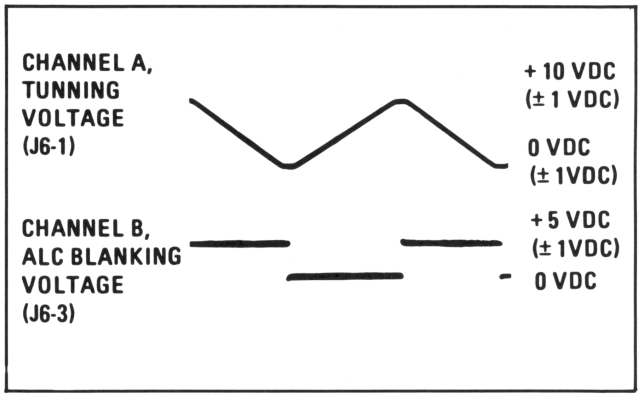


Figure 4-4. RF Blanking Pulse at J6-3 Compared in Time to J6-1 Ramp

Table 4-1. Performance Test Record

Hewlett-Packard Model 8620B
Sweep Oscillator

Tests Performed by: _____

Serial No.

Date: _____

	Upper	Test Value	Lower
4-7. START/STOP Sweep Mode			
Manual Sweep Check			
Manual control CCW — START/CW at left-hand edge graticule	+0.05 Vdc	_____	—0.05 Vdc
Manual control CCW — START/CW at center graticule	+5.05 Vdc	_____	+4.95 Vdc
Manual control CCW — START/CW at right-hand edge graticule	+10.05 Vdc	_____	+9.95 Vdc
Manual control CW — STOP/ΔF at left-hand edge graticule	+0.05 Vdc	_____	—0.05 Vdc
Manual control CW — STOP/ΔF at center graticule	+5.05 Vdc	_____	+4.95 Vdc
Manual control CW — STOP/ΔF at right-hand edge graticule	+10.05 Vdc	_____	+9.95 Vdc
Automatic Sweep Check			
START/CW at left edge and STOP/ΔF at right edge			
Top of Ramp	+10.05 Vdc	_____	+9.95 Vdc
Bottom of Ramp	+0.05 Vdc	_____	—0.05 Vdc
4-8. External and Single Triggered Sweep			
Single Sweep Check			
START/CW at left edge and STOP/ΔF at right edge			
Top of Ramp	+10.05 Vdc	_____	+9.95 Vdc
Bottom of Ramp	+0.05 Vdc	_____	—0.05 Vdc
External Sweep Check			
START/CW at left edge and STOP/ΔF at right edge			
Top of Ramp	+10.05 Vdc	_____	+9.95 Vdc
Bottom of Ramp	+0.05 Vdc	_____	—0.05 Vdc

Table 4-1. Performance Test Record (Cont)

	Upper	Test Value	Lower
4-9. ΔF Sweep Mode			
ΔF at right-hand edge — MANUAL control counterclockwise	—0.495 Vdc	_____	—0.505 Vdc
ΔF at right-hand edge — MANUAL control clockwise	0.505 Vdc	_____	+0.495 Vdc
4-10. CW MODE			
CW at left-hand edge graticule	+0.05 Vdc	_____	—0.05 Vdc
CW at center graticule	+5.50 Vdc	_____	+4.95 Vdc
CW at right-hand edge graticule	+10.05 Vdc	_____	+9.95 Vdc
4-11. Amplitude Modulation			
1 kHz square wave as shown in Figure 4-2.		_____	Waveform OK
4-12. Blanking Output			
Blanked ramp signal as shown in Figure 4-3.		_____	Waveform OK
RF blanking as shown in Figure 4-4.		_____	Waveform OK

SECTION V
ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section provides adjustment procedures for the Model 8620B Sweep Oscillator mainframe. These procedures should not be performed as a routine maintenance procedure but should be used (1) after replacement of a part or component, (2) when the performance test shows that the specifications of Table 1-1 cannot be met, or (3) when instructed to do so in the troubleshooting tree in Section VIII. Before attempting any adjustment, allow 30 minutes warmup time for the instrument. Table 5-1 lists the adjustment controls and Figure 5-4 shows the location of each control.

5-3. EQUIPMENT REQUIRED

5-4. Table 1-3 lists the equipment required for the adjustment procedure. If the test equipment recommended is not available, other equipment may be used if its performances meets the "Critical Specifications" listed in the table.

5-5. FACTORY SELECTED COMPONENTS

5-6. None of the factory selected components in the Model 8620B are used for an alignment function.

5-7. RELATED ADJUSTMENTS

5-8. The +20-volt power supply regulator furnishes reference voltage to some of the other power supply regulators, therefore the +20-volt regulator must be adjusted first. If the sequence in the procedure is followed, a minimum of interaction between controls is present.

5-9. POWER SUPPLY ADJUSTMENTS

Note

Following the applicable test points the corresponding J6 pin number (RF Section interface connector) is given in parenthesis.

Ground DVM input to ground pin on board being probed.

5-10. +20 Volt Suply

a. Connect DVM to +20V test point on A4 (J6-34) (Figure 5-1).

b. If necessary adjust +20V ADJ control A4R21 for +20.000 Vdc ±0.006 Vdc.

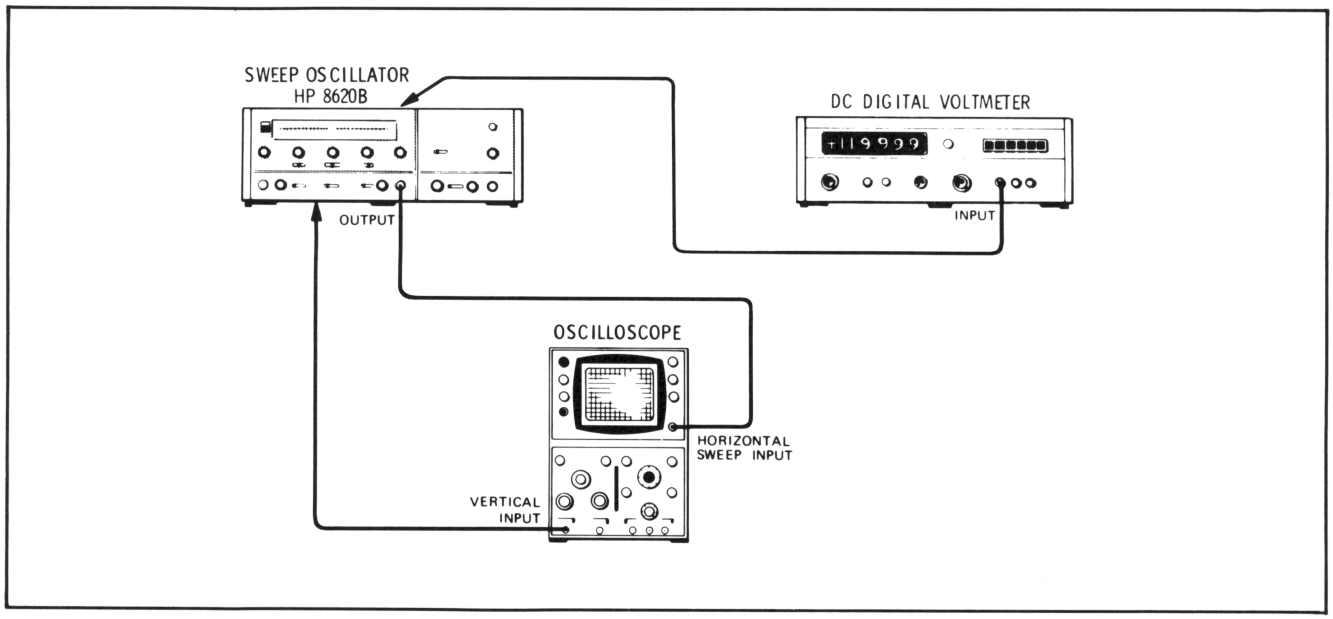


Figure 5-1. Model 8620B Adjustment Test Setup

Table 5-1. Controls Listed in Adjustment Sequence

Reference* Designation	Adjustment Paragraph	Name on* Board	Function Adjusted
A4R21	5-10	+20V ADJ	Sets +20 volt regulator
A5R19	5-11	—40V ADJ	Sets —40 volt regulator
A5R4	5-12	—10V ADJ	Sets —10 volt regulator
A4R15	5-13	+5V ADJ	Sets +5 volt regulator
A7R10	5-14	FAN ADJ	Sets fan speed to 3000 RPM (20 ms period)
A7R33	5-15	1 KHZ ADJ	Sets internal modulation oscillator to 1 kHz (1 ms period)
A2R25	5-16	OFF 1	Adjusts summing amplifier offset at 0 Vdc
A2R4	5-16	CW	Adjusts CW output for +10 Vdc at high frequency end
A2R9	5-17	START	Adjusts START output for +10 vdc at high frequency end
A2R3	5-17	SWP	Adjusts START output for 0 VDC offset
A2R12	5-17	STOP	Adjusts STOP output for +10 Vdc at high frequency end
A2R23	5-18	ΔF OFF	Adjusts ΔF output for 0 Vdc offset
A2R8	5-18	ΔF 1	Adjusts ΔF symmetry
A2R17	5-18	ΔF 2	Adjusts ΔF amplitude

*Adjustment locations are shown in Figure 5-4.

5-11. —40 Volt Supply

a. Connect DVM to —40V test point on A5 (J6-29).

b. If necessary, adjust —40V ADJ control A5R19 for —40.000 Vdc ±0.020 Vdc.

5-12. —10 Volt Supply

a. Connect DVM to —10V test point on A5 (J6-31).

b. If necessary, adjust —10V ADJ control A5R4 for —10.000 Vdc ±0.004 Vdc.

5-13. +5 Volt Supply

a. Connect DVM to +5V test point on A4 (J6-33).

b. If necessary, adjust +5V ADJ control A4R15 for +5.000 Vdc ±0.005 Vdc.

5-14. FAN ADJUSTMENTS

a. Connect oscilloscope through 10:1 probe sequentially to test points FAN 1, FAN 2, FAN 3, and FAN 4 on A7 board. Waveform should be similar and amplitude should be greater than 17 volts peak-to-peak. (See Figure 5-2.)

b. Adjust FAN ADJ control A7R10 for a 20 ms period on oscilloscope. This corresponds to 3000 RPM.

5-15. 1 kHz MODULATION ADJUSTMENT

a. Connect oscilloscope to 1 kHz test point on A7 (J6-6). Waveform should be similar to Figure 5-3.

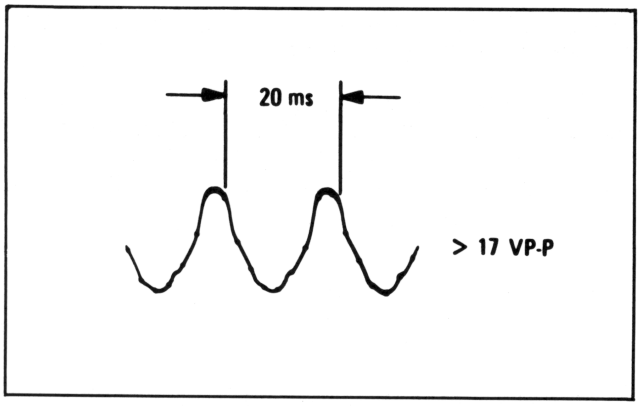


Figure 5-2. Fan Waveform

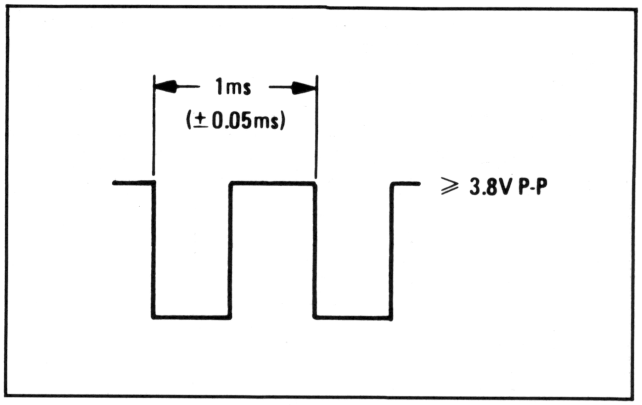


Figure 5-3. 1 kHz Waveform

b. Adjust 1 kHz ADJ control A7R33 for a 1 ms period on oscilloscope. This corresponds to 1 kHz.

5-16. CW ADJUSTMENT

Notes

1. The positions of the calibration scale are given in parenthesis throughout the procedure. If a calibration scale is not available, use any of the scales in the band switch drum.

2. To avoid parallax, view the pointer and scale directly from the front of the instrument.

a. Select the special calibration scale (if available) with band selector switch. Connect DVM between A2TP2 (J6-1) and A4 GND.

b. Set the Function switch to CW position. Set the green CW pointer to the left-hand edge graticule (0V).

c. Adjust circuit board OFF 1 control, A2R25, for 0.000 Vdc ±0.001 Vdc indication on DVM.

d. Adjust CW control to set the green CW pointer to the right-hand edge graticule (10V).

e. Adjust circuit board CW control A2R4 for +10.000 Vdc ±0.003 Vdc.

5-17. START-STOP ADJUSTMENT

a. Set Function switch to S/S position. Verify DVM is connected to A2TP2 (J6-1).

b. Set green START pointer to right-hand edge graticule (+10V). Set red STOP pointer to left-hand edge graticule (0V). Set SWEEP TRIGGER switch to AUTO positon and sweep TIME switch to MANUAL SWEEP position. Rotate MANUAL SWEEP control fully counterclockwise.

c. Adjust circuit board START control A2R9 for +10.000 Vdc ±0.005 Vdc indication on DVM.

d. Turn MANUAL sweep control fully clockwise. Adjust circuit board SWP control A2R3 for 0.000 Vdc ±0.005 Vdc indication on DVM.

e. Set red STOP pointer to right-hand edge graticule (+10V). Adjust circuit board STOP control A2R12 for +10.000 Vdc ±0.005 Vdc indication on DVM.

5-18. ΔF ADJUSTMENT

a. Set Function switch to CW position. Verify DVM is connected to A2TP2 (J6-1).

b. Set green CW pointer to left-hand edge graticule and make fine adjustment for 0.000 Vdc ±0.001 Vdc on DVM.

c. Set Function switch to ΔF position and sweep TIME switch to MANUAL SWEEP position.

d. Set red ΔF pointer to left-hand edge graticule (0V). Adjust circuit board ΔF OFF control A2R23 for 0.000 Vdc ±0.005 Vdc indication on DVM.

e. Set red ΔF pointer to right-hand edge graticule (+0.5V). Adjust MANUAL SWEEP con-

trol fully clockwise; read and note DVM indication.

f. Adjust MANUAL SWEEP control fully counterclockwise. Adjust circuit board ΔF control A2R8 for the negative DVM indication noted in step e, ±0.001 Vdc.

g. Repeat steps e and f until the two voltage magnitudes are equal.

h. Adjust circuit board ΔF 2 control A2R17 for +0.500 Vdc ±0.001 Vdc and −0.500 Vdc ±0.001 Vdc at the fully clockwise and counterclockwise positions of the MANUAL SWEEP control.

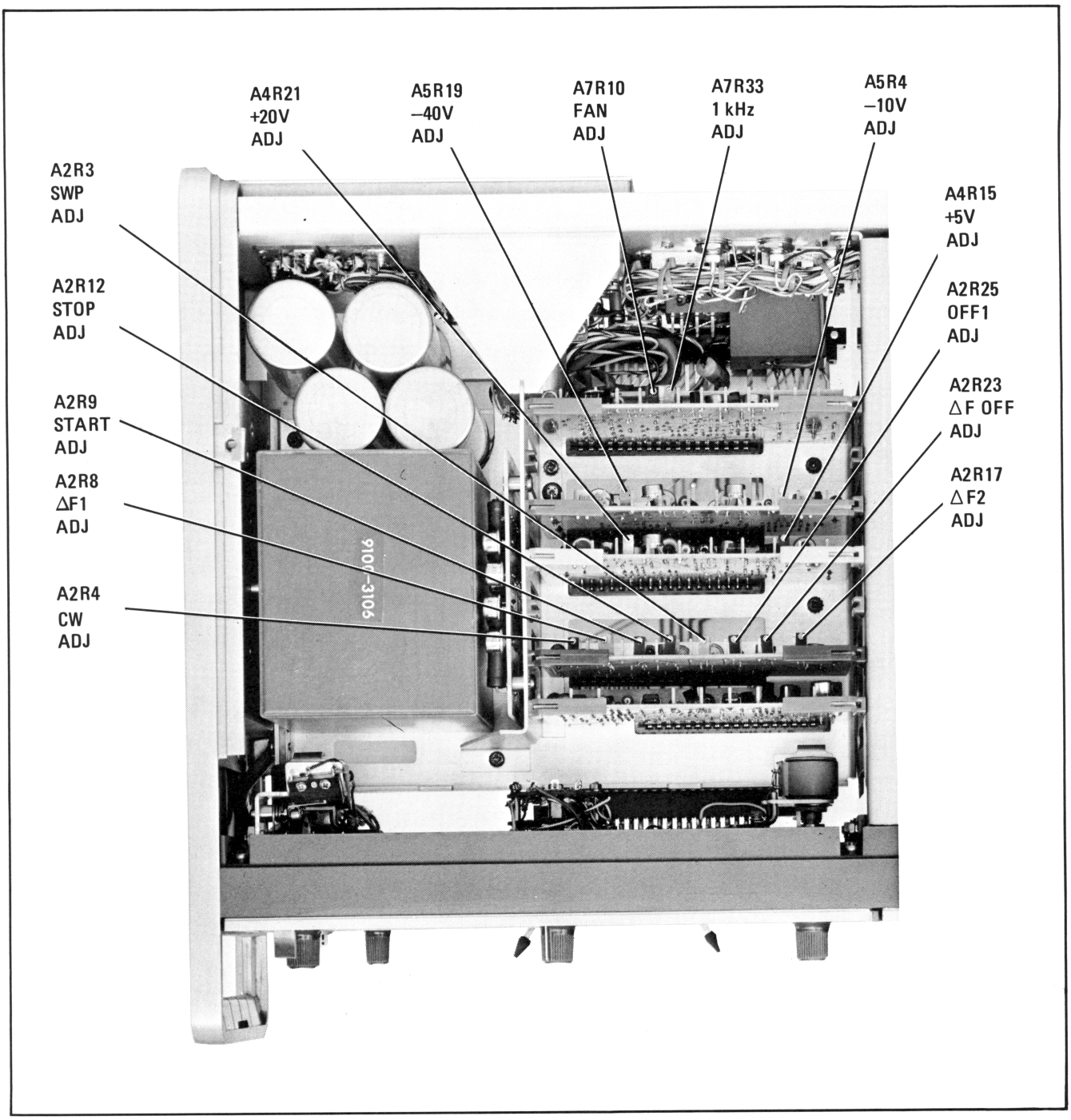


Figure 5-4. 8620B Mainframe Adjustment Locations

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replaceable parts. Table 6-1 gives the meanings of the abbreviations and reference designations used in the table of replaceable parts.

6-3. Table 6-2 is the table of replaceable parts and is organized as follows:

a. Electrical assemblies and their component parts in alpha-numerical order by reference designation.

b. Chassis parts in alpha-numerical order by reference designation.

c. Miscallenous parts.

d. Illustrated parts breakdowns, if appropriate.

6-4. The information given for each part consists of:

a. The Hewlett-Packard part number.

b. Total quantity (TQ) in the instrument. Total quantity for each part is given only once — at the first appearance of the part number.

c. Description of the part.

d. Typical manufacturer of the part, in a five-digit code.

e. The manufacturer's number for the part.

6-5. Table 6-3 contains the names and addresses that correspond to the manufacturer's code numbers.

6-6. ORDERING INFORMATION

6-7. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

6-8. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

Table 6-1. Reference Designations and Abbreviations

REFERENCE DESIGNATORS

A	= assembly	F	= fuse	P	= plug	V	= vacuum tube, neon bulb, photocell, etc.
B	= motor	FL	= Filter	Q	= transistor		
BT	= battery	J	= jack	R	= resistor		
C	= capacitor	K	= relay	RT	= thermistor	VR	= voltage regulator
CP	= coupler	L	= inductor	S	= switch		
CR	= diode	LS	= loud speaker	T	= transformer	W	= cable
DL	= delay line	M	= meter	TB	= terminal board	X	= socket
DS	= device signaling (lamp)	MK	= microphone	TP	= test point	Y	= crystal
E	= misc electronic part	MP	= mechanical part	U	= integrated circuit	Z	= tuned cavity, network

ABBREVIATIONS

A	= amperes	H	= henries	N/O	= normally open	RMO	= rack mount only
AFC	= automatic frequency control	HDW	= hardware	NOM	= nominal	RMS	= root-mean square
		HEX	= hexagonal	NPO	= negative positive zero (zero temperature coefficient)	RWV	= reverse working voltage
AMPL	= amplifier	HG	= mercury			S-B	= slow-blow
		HR	= hour(s)			SCR	= screw
BFO	= beat frequency oscillator	Hz	= Hertz			SE	= selenium
				NPN	= negative-positive-negative	SECT	= section(s)
BE CU	= beryllium copper	IF	= intermediate freq			SEMICON	= semiconductor
BH	= binder head	IMPG	= impregnated	NRFR	= not recommended for field replacement	SI	= silicon
BP	= bandpass	INCD	= incandescent			SIL	= silver
BRS	= brass	INCL	= include(s)			SL	= slide
BWO	= backward wave oscillator	INS	= insulation(ed)	NSR	= not separately replaceable	SPG	= spring
		INT	= internal			SPL	= special
				OBD	= order by description	SST	= Stainless steel
CCW	= counterclockwise	K	= kilo = 1000			SR	= split ring
CER	= ceramic			OH	= oval head	STL	= steel
CMO	= cabinet mount only			OX	= oxide		
COEF	= coefficient	LH	= left hand				
COM	= common	LIN	= linear taper	P	= peak	TA	= tantalum
COMP	= composition	LK WASH	= lock washer	PC	= printed circuit	TD	= time delay
COMPL	= complete	LOG	= logarithmic taper	PF	= picofarads = 10^{-12} farads	TGL	= toggle
CONN	= connector	LPF	= low pass filter			THD	= thread
CP	= cadmium plate			PH BRZ	= phosphor bronze	TI	= titanium
CRT	= cathode-ray tube			PHL	= Phillips	TOL	= tolerance
CW	= clockwise	M	= milli = 10^{-3}	PIV	= peak inverse voltage	TRIM	= trimmer
		MEG	= meg = 10^{6}			TWT	= traveling wave tube
DEPC	= deposited carbon	MET FLM	= metal film	PNP	= positive-negative-positive		
DR	= drive	MET OX	= metallic oxide				
		MFR	= manufacturer	P/O	= part of	μ	= micro = 10^{-6}
ELECT	= electrolytic	MHz	= mega Hertz	POLY	= polystrene		
ENCAP	= encapsulated	MINAT	= miniature	PORC	= porcelain		
EXT	= external	MOM	= momentary	POS	= position(s)	VAR	= variable
		MOS	= metalized substrate	POT	= potentiometer	VDCW	= dc working volts
F	= farads			PP	= peak-to-peak		
FH	= flat head	MTG	= mounting	PT	= point		
FIL H	= Fillister head	MY	= "mylar"	PWV	= peak working voltage	W/	= with
FXD	= fixed					W	= watts
		N	= nano (10^{-9})	RECT	= rectifier	WIV	= working inverse voltage
G	= giga (10^{9})	N/C	= normally closed	RF	= radio frequency		
GE	= germanium	NE	= neon	RH	= round head or right hand	WW	= wirewound
GL	= glass	NI PL	= nickel plate			W/O	= without
GRD	= ground(ed)						

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	08620-60006	1	BOARD ASSY:SWEEP OSCILLATOR	28480	08620-60006
A1C1	0180-0228	1	C:FXD ELECT 22 UF 10% 15VDCW	56289	150D226X9015B2-DYS
A1C2	0180-0094	1	C:FXD ELECT 100 UF +75-10% 25VDCW	56289	30D107G025DD2-DSM
A1C3	0160-2055	4	C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A1C4	0160-0155	2	C:FXD MY 0.0033 UF 10% 200VDCW	56289	192P33292-PTS
A1C5	0160-0155		C:FXD MY 0.0033 UF 10% 200VDCW	56289	192P33292-PTS
A1C6	0170-0066	1	C:FXD MY 0.027 UF 10% 200VDCW	56289	192P27392-PTS
A1C7	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A1C8	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A1C9	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A1CR1	1901-0025	28	DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR2	1910-0016	2	DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1CR3	1902-3082	3	DIODE BREAKDOWN:4.64V 5%	28480	1902-3082
A1CR4	1902-0025	1	DIODE,BREAKDOWN:10.0V 5% 400 MW	28480	1902-0025
A1CR5	1902-3082		DIODE BREAKDOWN:4.64V 5%	28480	1902-3082
A1CR6	1902-3082		DIODE BREAKDOWN:4.64V 5%	28480	1902-3082
A1CR7	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR8	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR9	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR10	1901-0050	1	DIODE:SI 200 MA AT 1V	07263	FDA 6308
A1CR11	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR12	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR13	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1K1	0490-0875	1	RELAY:REED 12V 2 AMP	77342	HP 4038
A1L1	9140-0137	6	COIL:FXD RF 1000 UH 5%	28480	9140-0137
A1L2	9140-0137		COIL:FXD RF 1000 UH 5%	28480	9140-0137
A1MP1	4040-0749	2	EXTRACTOR:PC BOARD, BROWN	28480	4040-0749
A1Q1	1854-0071	13	TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1Q2	1853-0020	8	TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1Q4	1855-0062	1	TSTR:SI FET 30V	01295	2N1595
A1Q5	1853-0012	5	TSTR:SI PNP	80131	2N2904A
A1Q6	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1Q8	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q9	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q10	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1R1	0757-0180	4	R:FXD MET FLM 31.6 OHM 1% 1/8W	28480	0757-0180
A1R2	0698-3450	2	R:FXD MET FLM 42.2K OHM 1% 1/8W	28480	0698-3450
A1R3	0757-0444	3	R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A1R4	0757-0280	15	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1R5	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1R6	0757-0442	15	R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R7	0698-3152	6	R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A1R8	0698-3152		R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A1R9	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R10	0757-0449	1	R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A1R11	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1R12	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1R13	0698-3151	2	R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A1R14	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R15	0698-0083	6	R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A1R16	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1R17	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1R18	0698-3151		R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A1R19	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R20	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R21	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A1R22	0757-0399	1	R:FXD MET FLM 82.5 OHM 1% 1/8W	28480	0757-0399
A1R23	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A1R24	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1R25	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A1R26	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R27	0698-3162	1	R:FXD MET FLM 46.4K OHM 1% 1/8W	28480	0698-3162
A1R28	0757-0465	5	R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A1R29	0757-0419	1	R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A1R30	0757-1094	7	R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A1R31	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A1R32	0698-0084	2	R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A1R33	0757-0428	2	R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A1R34	0757-0289	1	R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
A1R35	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1R36	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R37	0757-0438	5	R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A1R38	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1R39	0698-0085	5	R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A1R40	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R41	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A1R42	0757-0288	3	R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A1R43	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A1R44	0698-3450		R:FXD MET FLM 42.2K OHM 1% 1/8W	28480	0698-3450
A1U1	1820-0216	7	INTEGRATED CIRCUIT:OPERATIONAL AMPL.	07263	SL8941
A1U2	1820-0216		INTEGRATED CIRCUIT:OPERATIONAL AMPL.	07263	SL8941
A1U3	1820-0054	5	IC:TTL QUAD 2-INPUT NAND GATE	01295	SN4342
A1U4	1820-0054		IC:TTL QUAD 2-INPUT NAND GATE	01295	SN4342
A1U5	1820-0411	2	IC:DIGITAL QUAD 2-INPT	28480	1820-0411
A1U6	1820-0216		INTEGRATED CIRCUIT:OPERATIONAL AMPL.	07263	SL8941
A1U7	1820-0216		INTEGRATED CIRCUIT:OPERATIONAL AMPL.	07263	SL8941
A1U8	1820-0076	1	IC:TTL DUAL MASTER/SLAVE FF	01295	SN4355
A1U9	1821-0001	3	TRANSISTOR ARRAY:SI NPN	02735	CA3046
A1U10	1820-0411		IC:DIGITAL QUAD 2-INPT	28480	1820-0411
A1U11	1820-0201	1	INTEGRATED CIRCUIT:OPERATIONAL AMPL	04713	MC1439G
A2	08620-60052	1	BOARD ASSY:FREQUENCY CONTROL	28480	08620-60052
A2C1	0180-0097	3	C:FXD ELECT 47 UF 10% 35VDCW	56289	159D476X9035S2-DYS
A2C2	0180-0097		C:FXD ELECT 47 UF 10% 35VDCW	56289	159D476X9035S2-DYS
A2C3	0180-0097		C:FXD ELECT 47 UF 10% 35VDCW	56289	159D476X9035S2-DYS
A2L1	9140-0137		COIL:FXD RF 1000 UH 5%	28480	9140-0137
A2L2	9140-0137		COIL:FXD RF 1000 UH 5%	28480	9140-0137
A2L3	9140-0137		COIL:FXD RF 1000 UH 5%	28480	9140-0137
A2MP1	4040-0750	2	EXTRACTOR:PC BOARD, RED	28480	4040-0750
A2MP2	4040-0750		EXTRACTOR:PC BOARD, RED	28480	4040-0750
A2R1	0698-3153	4	R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A2R2	0698-3150	2	R:FXD MET FLM 2.37K OHM 1% 1/8W	28480	0698-3150
A2R3	2100-1799	2	R:VAR WW 500 OHM 10% 1W	28480	2100-1799
A2R4	2100-2851	5	R:VAR WW 2K OHM 10% 1W	28480	2100-2851
A2R5	0811-2997	1	R:FXD WW 18.8K OHM	28480	0811-2997
A2R6	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A2R7	0698-3243	1	R:FXD MET FLM 178K OHM 1% 1/8W	28480	0698-3243
A2R8	2100-3054	1	R:VAR CERMET 50K OHM 10% 3/4W	28480	2100-3054
A2R9	2100-2851		R:VAR WW 2K OHM 10% 1W	28480	2100-2851
A2R10	0757-0288		R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A2R11	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R12	2100-2851		R:VAR WW 2K OHM 10% 1W	28480	2100-2851
A2R13	0757-0288		R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A2R14	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R15	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R16	0811-1196	4	R:FXD WW 5.0K OHM 0.1% 1/16W	28480	0811-1196
A2R17	2100-2851		R:VAR WW 2K OHM 10% 1W	28480	2100-2851
A2R18	0757-0439	1	R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A2R19	0698-0085		R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A2R20	0811-1196		R:FXD WW 5.0K OHM 0.1% 1/16W	28480	0811-1196
A2R21	0811-1196		R:FXD WW 5.0K OHM 0.1% 1/16W	28480	0811-1196
A2R22	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A2R23	2100-2850	2	R:VAR WW 10K OHM 10% 1W	28480	2100-2850
A2R24	0811-1196		R:FXD WW 5.0K OHM 0.1% 1/16W	28480	0811-1196
A2R25	2100-2850		R:VAR WW 10K OHM 10% 1W	28480	2100-2850
A2U1	1826-0007	5	IC:OPERATIONAL AMPLIFIER	28480	1826-0007
A2U2	1826-0007		IC:OPERATIONAL AMPLIFIER	28480	1826-0007
A2U3	1826-0007		IC:OPERATIONAL AMPLIFIER	28480	1826-0007
A2U4	1826-0007		IC:OPERATIONAL AMPLIFIER	28480	1826-0007
A2U5	1826-0007		IC:OPERATIONAL AMPLIFIER	28480	1826-0007
A3			NOT ASSIGNED		
A4	08620-60009	1	BOARD ASSY:+5+20 REGULATOR	28480	08620-60009
A4C1	0180-2208	4	C:FXD ELECT 220 UF 10% 10VDCW	56289	150D227X9010S2-DYS
A4C2	0160-0158	1	C:FXD MY 0.0056 UF 10% 200VDCW	56289	192P56292-PTS
A4C3	0180-0235	3	C:FXD ELECT 56 UF 20% 75VDCW	56289	109D566X0075T2
A4C4	0180-2208		C:FXD ELECT 220 UF 10% 10VDCW	56289	150D227X9010S2-DYS
A4C5	0160-0301	2	C:FXD MY 0.012 UF 10% 200VDCW	56289	192P12392-PTS
A4CR1	1901-0376	2	DIODE:SILICON 35V	28480	1901-0376
A4CR2	1902-3139	4	DIODE:BREAKDOWN 8.25V 5%	04713	SZ10939-158
A4CR3	1901-0159	9	DIODE:SILICON 0.75A 400PIV	04713	SR1358-4
A4CR4	1902-0202	2	DIODE BREAKDOWN:15.0V 5% 1W	28480	1902-0202
A4CR5	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A4CR6	1902-3182	3	DIODE BREAKDOWN:SILICON 12.1V 5%	28480	1902-3182
A4CR7	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A4CR8	1902-3182		DIODE BREAKDOWN:SILICON 12.1V 5%	28480	1902-3182
A4CR9	1901-0159		DIODE:SILICON 0.75A 400PIV	04713	SR1358-4
A4CR10	1902-0049	1	DIODE:BREAKDOWN 6.19V 5%	04713	SZ10939-122
A4CR11	1884-0012	5	RECTIFIER:SILICON CONTROLLED 2N3528	02735	2N3528
A4CR12	1901-0159		DIODE:SILICON 0.75A 400PIV	04713	SR1358-4

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4CR13	1902-0071	2	DIODE:BREAKDOWN 9.0V 5%	28480	1902-0071
A4CR14	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A4CR15	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A4CR16	1902-0184	1	DIODE BREAKDOWN:SILICON 16.2V 5%	28480	1902-0184
A4CR17	1902-3256	1	DIODE:BREAKDOWN SILICON 23.7V 5%	28480	1902-3256
A4CR18	1884-0012		RECTIFIER:SILICON CONTROLLED 2N3528	02735	2N3528
A4F1	2110-0332	6	FUSE:3A	71400	GMW 3
A4F2	2110-0332		FUSE:3A	71400	GMW 3
A4MP1	4040-0752	2	EXTRACTOR:PC BOARD, YELLOW	28480	4040-0752
A4MP2	4040-0752		EXTRACTOR:PC BOARD, YELLOW	28480	4040-0752
A4Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q2	1854-0039	1	TSTR:SI NPN	80131	2N3053
A4Q3	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A4Q4	1853-0038	2	TSTR:SI PNP	28480	1853-0038
A4R1	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A4R2	0764-0015	1	R:FXD MET FLM 560 OHM 5% 2W	28480	0764-0015
A4R3	0757-0417	1	R:FXD MET FLM 562 OHM 1% 1/8W	28480	0757-0417
A4R4	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A4R5	0811-1666	2	R:FXD WW 1.0 OHM 5% 2W	28480	0811-1666
A4R6	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A4R7	0698-3460	1	R:FXD MET FLM 422K OHM 1% 1/8W	28480	0698-3460
A4R8	0698-3454	2	R:FXD MET FLM 215K OHM 1% 1/8W	28480	0698-3454
A4R9	0757-0447	1	R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
A4R10	0698-3150		R:FXD MET FLM 2.37K OHM 1% 1/8W	28480	0698-3150
A4R11	0757-0466	2	R:FXD MET FLM 110K OHM 1% 1/8W	28480	0757-0466
A4R12	0698-3454		R:FXD MET FLM 215K OHM 1% 1/8W	28480	0698-3454
A4R13	0757-0466		R:FXD MET FLM 110K OHM 1% 1/8W	28480	0757-0466
A4R14	0757-0278	1	R:FXD MET FLM 1.78K OHM 1% 1/8W	28480	0757-0278
A4R15	2100-1973	1	R:VAR WW 200 OHM 10% 1W	28480	2100-1973
A4R16	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4R17	0757-0397	5	R:FXD MET FLM 68.1 OHM 1% 1/8W	28480	0757-0397
A4R18	0698-3447	4	R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A4R19	0812-0014	1	R:FXD WW 0.5 OHM 3% 5W	28480	0812-0014
A4R20	0757-0290	1	R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
A4R21	2100-1799		R:VAR WW 500 OHM 10% 1W	28480	2100-1799
A4R22	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A4R23	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A4R24	0757-0180		R:FXD MET FLM 31.6 OHM 1% 1/8W	28480	0757-0180
A4R25	0757-0394	6	R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A4R26	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A4R27	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A4R28	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A4R29	0698-0082	1	R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A4R30	0757-1060	1	R:FXD MET FLM 196 OHM 1% 1/2W	28480	0757-1060
A4R31	0698-3447		R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A4R32	0757-0397		R:FXD MET FLM 68.1 OHM 1% 1/8W	28480	0757-0397
A4U1	1821-0001		TRANSISTOR ARRAY:SI NPN	02735	CA3046
A4U2	1820-0216		INTEGRATED CIRCUIT:OPERATIONAL AMPL.	07263	SL8941
A5	08620-60010	1	BOARD ASSY:-10-40 REGULATOR	28480	08620-60010
A5C1	0180-0235		C:FXD ELECT 56 UF 20% 75VDCW	56289	109D566X0075T2
A5C2	0180-2208		C:FXD ELECT 220 UF 10% 10VDCW	56289	150D227X9010S2-DYS
A5C3	0160-0153	2	C:FXD MY 0.001 UF 10% 200VDCW	56289	192P10292-PTS
A5C4	0160-0970	1	C:FXD MY 0.47UF 10% 80VDCW	56289	192P4749R8-PTS
A5C5	0160-0299	1	C:FXD MY 1800 PF 10% 200VDCW	56289	192P18292-PTS
A5C6	0180-0235		C:FXD ELECT 56 UF 20% 75VDCW	56289	109D566X0075T2
A5C7	0180-2208		C:FXD ELECT 220 UF 10% 10VDCW	56289	150D227X9010S2-DYS
A5C8	0160-0301		C:FXD MY 0.012 UF 10% 200VDCW	56289	192P12392-PTS
A5CR1	1901-0376		DIODE:SILICON 35V	28480	1901-0376
A5CR2	1902-3139		DIODE:BREAKDOWN 8.25V 5%	04713	SZ10939-158
A5CR3	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR4	1902-0202		DIODE BREAKDOWN:15.0V 5% 1W	28480	1902-0202
A5CR5	1901-0159		DIODE:SILICON 0.75A 400PIV	04713	SR1358-4
A5CR6	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR7	1902-3182		DIODE BREAKDOWN:SILICON 12.1V 5%	28480	1902-3182
A5CR8	1884-0012		RECTIFIER:SILICON CONTROLLED 2N3528	02735	2N3528
A5CR9	1901-0159		DIODE:SILICON 0.75A 400PIV	04713	SR1358-4
A5CR10	1901-0159		DIODE:SILICON 0.75A 400PIV	04713	SR1358-4
A5CR11	1902-3139		DIODE:BREAKDOWN 8.25V 5%	04713	SZ10939-158
A5CR12	1902-3139		DIODE:BREAKDOWN 8.25V 5%	04713	SZ10939-158
A5CR13	1901-0159		DIODE:SILICON 0.75A 400PIV	04713	SR1358-4
A5CR14	1902-0071		DIODE:BREAKDOWN 9.0V 5%	28480	1902-0071
A5CR15	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR16	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR17	1902-0556	1	DIODE:BREAKDOWN 20.0V 5% 1W	28480	1902-0556
A5CR18	1902-3333	1	DIODE BREAKDOWN:46.4V 5%	07910	CD35898

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5CR19	1884-0012		RECTIFIER:SILICON CONTROLLED 2N3528	02735	2N3528
A5F1	2110-0332		FUSE:3A	71400	GMW 3
A5F2	2110-0332		FUSE:3A	71400	GMW 3
A5MP1	4040-0753	2	EXTRACTOR:PC BOARD, GREEN	28480	4040-0753
A5MP2	4040-0753		EXTRACTOR:PC BOARD, GREEN	28480	4040-0753
A5Q1	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A5Q2	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A5Q3	1853-0038		TSTR:SI PNP	28480	1853-0038
A5Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q5	1854-0022	1	TSTR:SI NPN	07263	S17843
A5R1	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A5R2	0757-0814	1	R:FXD MET FLM 511 OHM 1% 1/2W	28480	0757-0814
A5R3	0757-0397		R:FXD MET FLM 68.1 OHM 1% 1/8W	28480	0757-0397
A5R4	2100-1702	1	R:VAR WW 100 OHM 10% 1W	28480	2100-1702
A5R5	0757-0422	1	R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A5R6	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A5R7	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A5R8	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A5R9	0698-3442	1	R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A5R10	0698-3155	5	R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A5R11	0811-1552	1	R:FXD WW 0.56 OHM 5% 2W	28480	0811-1552
A5R12	0698-3447		R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A5R13	0757-0397		R:FXD MET FLM 68.1 OHM 1% 1/8W	28480	0757-0397
A5R14	0757-0416	1	R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A5R15	0811-1665	1	R:FXD WW 0.82 OHM 5% 2W	28480	0811-1665
A5R16	0698-3637	1	R:FXD MET OX 820 OHM 5% 2W	28480	0698-3637
A5R17	0698-3159	1	R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A5R18	2100-2852	2	R:VAR WW 1000 OHM 10% 1W	28480	2100-2852
A5R19	0757-0440	1	R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
A5R20	0698-3346	1	R:FXD MET FLM 4.22K OHM 1% 1/2W	28480	0698-3346
A5R21	0757-0180		R:FXD MET FLM 31.6 OHM 1% 1/8W	28480	0757-0180
A5R22	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A5R23	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A5R24	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A5R25	0698-3157	1	R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A5R26	0698-3440	1	R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A5R27	0757-1078	1	R:FXD MET FLM 1.47K OHM 1% 1/2W	28480	0757-1078
A5R28	0698-3447		R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A5R29	0757-0397		R:FXD MET FLM 68.1 OHM 1% 1/8W	28480	0757-0397
A5R30	0757-0180		R:FXD MET FLM 31.6 OHM 1% 1/8W	28480	0757-0180
A5U1	1820-0216		INTEGRATED CIRCUIT:OPERATIONAL AMPL.	07263	SL8941
A5U2	1820-0216		INTEGRATED CIRCUIT:OPERATIONAL AMPL.	07263	SL8941
A6			NOT ASSIGNED		
A7	08620-60012	1	BOARD ASSY:OPERATIONAL CONTROL	28480	08620-60012
A7C1	0160-0161	2	C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A7C2	0180-0234	1	C:FXD ELECT 33 UF 20% 75VDCW	56289	109D336X0075F2
A7C3	0180-0106	2	C:FXD ELECT 60 UF 20% 6VDCW	28480	0180-0106
A7C4	0180-1714	1	C:FXD ELECT 330 UF 10% 6VDCW	28480	0180-1714
A7C5	0180-0106		C:FXD ELECT 60 UF 20% 6VDCW	28480	0180-0106
A7C6	0180-0218	2	C:FXD ELECT 0.15 UF 10% 35VDCW	28480	0180-0218
A7C7	0180-0218		C:FXD ELECT 0.15 UF 10% 35VDCW	28480	0180-0218
A7C8	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A7CR1	1901-0159		DIODE:SILICON 0.75A 400PIV	04713	SR1358-4
A7CR2	1901-0159		DIODE:SILICON 0.75A 400PIV	04713	SR1358-4
A7CR3	1902-3036	1	DIODE:BREAKDOWN 3.16V 5%	04713	SZ10939-38
A7CR4	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR5	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR6	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR7	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR8	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A7CR9	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR10	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR11	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR12	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR13	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR14	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7CR15	1884-0012		RECTIFIER:SILICON CONTROLLED 2N3528	02735	2N3528
A7CR16	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A7L1	9140-0137		COIL:FXD RF 1000 UH 5%	28480	9140-0137
A7MP1	4040-0755	2	EXTRACTOR:PC BOARD, VIOLET	28480	4040-0755
A7MP2	4040-0755		EXTRACTOR:PC BOARD, VIOLET	28480	4040-0755
A7MP3	1205-0050	1	HEAT DISSIPATOR	28480	1205-0050
A7Q1	1854-0003	1	TSTR:SI NPN(SELECTED FROM 2N1711)	28480	1854-0003
A7Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7Q3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7Q5	1853-0084	4	TSTR:SI PNP	80131	2N4918
A7Q6	1853-0050	4	TSTR:SI PNP	28480	1853-0050
A7Q7	1853-0012		TSTR:SI PNP	80131	2N2904A
A7Q8	1853-0012		TSTR:SI PNP	80131	2N2904A
A7Q9	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7Q10	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A7Q11	1853-0084		TSTR:SI PNP	80131	2N4918
A7Q12	1853-0050		TSTR:SI PNP	28480	1853-0050
A7Q13	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7Q14	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7Q15	1853-0084		TSTR:SI PNP	80131	2N4918
A7Q16	1853-0050		TSTR:SI PNP	28480	1853-0050
A7Q17	1853-0012		TSTR:SI PNP	80131	2N2904A
A7Q18	1853-0012		TSTR:SI PNP	80131	2N2904A
A7Q19	1853-0084		TSTR:SI PNP	80131	2N4918
A7Q20	1853-0050		TSTR:SI PNP	28480	1853-0050
A7R1	0698-3438	2	R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R2	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R3	0698-3430	1	R:FXD MET FLM 21.5 OHM 1% 1/8W	28480	0698-3430
A7R4	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A7R5	0698-0085		R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A7R6	0811-1674	1	R:FXD WW 4.7 OHM 5% 2W	28480	0811-1674
A7R7	0698-3458	2	R:FXD MET FLM 348K OHM 1% 1/8W	28480	0698-3458
A7R8	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A7R9	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A7R10	2100-2851		R:VAR WW 2K OHM 10% 1W	28480	2100-2851
A7R11	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A7R12	0698-3152		R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A7R13	0698-3136	4	R:FXD MET FLM 17.8K OHM 1% 1/8W	28480	0698-3136
A7R14	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A7R15	0757-0470	1	R:FXD MET FLM 162K OHM 1% 1/8W	28480	0757-0470
A7R16	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A7R17	0698-3152		R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A7R18	0698-3136		R:FXD MET FLM 17.8K OHM 1% 1/8W	28480	0698-3136
A7R19	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A7R20	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A7R21	0698-3152		R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A7R22	0698-3136		R:FXD MET FLM 17.8K OHM 1% 1/8W	28480	0698-3136
A7R23	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A7R24	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A7R25	0698-3152		R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A7R26	0698-3136		R:FXD MET FLM 17.8K OHM 1% 1/8W	28480	0698-3136
A7R27	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A7R28	0698-3458		R:FXD MET FLM 348K OHM 1% 1/8W	28480	0698-3458
A7R29	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A7R30	0757-0401	1	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A7R31	0811-1666		R:FXD WW 1.0 OHM 5% 2W	28480	0811-1666
A7R32	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A7R33	2100-2852		R:VAR WW 1000 OHM 10% 1W	28480	2100-2852
A7R34	0698-3154	2	R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A7R35	0698-3154		R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A7R36	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A7R37	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A7R38	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A7R39	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A7U1	1821-0001		TRANSISTOR ARRAY:SI NPN	02735	CA3046
A7U2	1820-0054		IC:TTL QUAD 2-INPUT NAND GATE	01295	SN4342
A7U3	1820-0054		IC:TTL QUAD 2-INPUT NAND GATE	01295	SN4342
A7U4	1820-0054		IC:TTL QUAD 2-INPUT NAND GATE	01295	SN4342
A7U5	1820-0328	1	IC:TTL QUAD 2-INPT NOR GATE	01295	SN4467
A8	08620-60013	1	BOARD ASSY:RECTIFIER	28480	08620-60013
A8C1	0160-2118	3	C:FXD MY 0.18 UF 10% 200VDCW	28480	0160-2118
A8C2	0170-0040	1	C:FXD MY 0.047 UF 10% 200VDCW	56289	192P47392-PTS
A8C3	0160-2118		C:FXD MY 0.18 UF 10% 200VDCW	28480	0160-2118
A8C4	0160-2118		C:FXD MY 0.18 UF 10% 200VDCW	28480	0160-2118
A8CR1	1901-0418	16	DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR2	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR3	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR4	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR5	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR6	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR7	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR8	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR9	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8CR10	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR11	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR12	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR13	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR14	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR15	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR16	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR17	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A8CR18	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A8Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A8R1	0698-0085		R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A8R2	0698-0085		R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A8R3	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A8R4	0757-0199	1	R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A8R5	0757-0441	2	R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A8R6	0757-0443	1	R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A8R7	0757-0461	1	R:FXD MET FLM 68.1K OHM 1% 1/8W	28480	0757-0461
A9			NOT ASSIGNED		
A10			NOT ASSIGNED		
A11	08620-60051	1	BOARD ASSY:MASTER	28480	08620-60051
A11C1	0180-2317	2	C:FXD ELECT 3600 UF +75-10% 40VDCW	56289	36D362G040AB2A-DQB
A11C2	0180-2180	1	C:FXD ELECT 2600 UF +75-10% 50VDCW	28480	0180-2180
A11C3	0180-2317		C:FXD ELECT 3600 UF +75-10% 40VDCW	56289	36D362G040AB2A-DQB
A11C4	0180-2316	1	C:FXD ELECT 900 UF +50-10% 100VDCW	56289	36D901F100 AB2A-DQB
A11J1	1251-1968	1	CONNECTOR:PC 10 TUNING FORK TYPE CONT	02660	143-010-07-1158
A11XA1	1251-2134	3	CONNECTOR:PC (2X18)36 CONTACTS	71785	252-18-30-340
A11XA2	1251-2134		CONNECTOR:PC (2X18)36 CONTACTS	71785	252-18-30-340
A11XA3			NOT ASSIGNED		
A11XA4	1251-1513	3	CONNECTOR:PC 18 TUNING FORK TYPE CONT	02660	143-018-07-1158
A11XA5	1251-1513		CONNECTOR:PC 18 TUNING FORK TYPE CONT	02660	143-018-07-1158
A11XA6			NOT ASSIGNED		
A11XA7	1251-2134		CONNECTOR:PC (2X18)36 CONTACTS	71785	252-18-30-340
A11XA8	1251-1513		CONNECTOR:PC 18 TUNING FORK TYPE CONT	02660	143-018-07-1158

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CHASSIS PARTS		
B1	3140-0490	1	MOTOR:DC 10-15V	95984	1AD3001-DA
B1	3160-0217	1	FAN BLADE:3.0" DIA	04870	3LM8 079S
B1	08620-00020	1	FAN GUARD	28480	08620-00020
C1	0170-0060	1	C:FXD MY 0.047UF 10% 400VDCW	84411	TYPE 663 UW
C2	0180-0098	1	C:FXD ELECT 100 UF 20% 20VDCW	56289	150D107X0020S2-DYS
C3	0180-0373	1	C:FXD ELECT 0.68 UF 10% 35VDCW	56289	150D684X9035A2-DYS
F1	2110-0002	1	FUSE:CARTRIDGE 2 AMP 3 AG	75915	312.002
F1			(FOR 115V OPERATION)		
F1	2110-0001	1	FUSE:1 AMP 250V	75915	312001.
F1			(FOR 230V OPERATION)		
FL1	5060-1188	2	POWER LINE MODULE	28480	5060-1188
J1	1250-1096	1	CONNECTOR:RF REAR MOUNTING	27251	28 JR159-1
J2	1251-0233	1	CONNECTOR:PC 44 CONTACTS	28480	1251-0233
J3	1250-0118	5	CONNECTOR:BNC	24931	28JR 128-1
J4	1250-0118		CONNECTOR:BNC	24931	28JR 128-1
J5	1250-0118		CONNECTOR:BNC	24931	28JR 128-1
J6	1251-0484	1	CONNECTOR:R & P 36 CONTACT RECEPTACLE	28480	1251-0484
J7	1251-2834	1	CONNECTOR:60 PIN	28480	1251-2834
J8	1250-0118		CONNECTOR:BNC	24931	28JR 128-1
J8	5040-0702	2	INSULATOR:CONNECTOR	28480	5040-0702
J9	1250-0118		CONNECTOR:BNC	24931	28JR 128-1
J9	5040-0702		INSULATOR:CONNECTOR	28480	5040-0702
LF1	5060-1188		POWER LINE MODULE	28480	5060-1188
Q1	1853-0059	2	TSTR:SI PNP	80131	2N3791
Q2	1854-0063	1	TSTR:SI NPN	80131	2N3055
Q3	1853-0059		TSTR:SI PNP	80131	2N3791
Q4	1854-0080	1	TSTR:SI NPN	28480	1854-0080
R1	0698-3449	1	R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
R2	2100-3101	1	R:VAR 1K/10K OHM	28480	2100-3101
R2MP1	0370-1003	2	KNOB:ROUND	28480	0370-1003
R3	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
R4	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
R4MP1	0370-1375	2	KNOB:PUSHBUTTON	28480	0370-1375
R5	2100-2867	2	R:VAR WW 10K OHM 3% LIN 1.5W	28480	2100-2867
R5MP1	0370-1375		KNOB:PUSHBUTTON	28480	0370-1375
R6	2100-2867		R:VAR WW 10K OHM 3% LIN 1.5W	28480	2100-2867
R7	0757-0441		R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
R8	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
R9	0757-0424	1	R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
S1	3101-0859	1	SWITCH:MICRO MINIATURE	28480	3101-0859
S1MP1	08620-40004	1	LEVER:BAND	28480	08620-40004
S2	3100-3013	1	SWITCH:ROTARY 3P3T	28480	3100-3013
S2MP1	0370-1103	1	KNOB:POINTER	28480	0370-1103
S3	3101-1395	1	SWITCH:PUSHBUTTON DPDT	76854	53-67280-121/A1H
S3DS1	2140-0244	1	LAMP:GLOW MINIATURE 95V	87034	A1H
S4	3100-3014	2	SWITCH:LEVER 3 POSITION	28480	3100-3014
S4MP1	0370-0432	2	KNOB:BLACK LEVER	28480	0370-0432
S5	3100-3014		SWITCH:LEVER 3 POSITION	28480	3100-3014
S5MP1	0370-0432		KNOB:BLACK LEVER	28480	0370-0432
S6	3101-1159	1	SWITCH:PUSHBUTTON SPDT	82389	10S-1051
S6MP1	0590-0950	1	NUT	00000	OBD
S7	3101-0106	2	SWITCH:SLIDE DP3T	82389	11D-1031C
S8	3101-0106		SWITCH:SLIDE DP3T	82389	11D-1031C
T1	9100-3106	1	TRANSFORMER	28480	9100-3106
W1	08620-60017	1	CABLE ASSY:POWER	28480	08620-60017
			MISCELLANEOUS		
	08620-60057	1	KIT:ACCESSORY	28480	08620-60057
	08620-60014	1	BOARD:EXTENDER(P/O ACCESS. KIT)	28480	08620-60014
	2110-0332		FUSE:3A (P/OACCESS. KIT)	71400	GMW 3

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	5000-0051	2	TRIM STRIP:ALUMINUM	28480	5000-0051
	5060-0222	4	HANDLE ASSY:SIDE	28480	5060-0222
	5060-0252	1	COVER ASSY:BOTTOM	28480	5060-0252
	5060-0251	1	COVER ASSY:TOP	28480	5060-0251
	5060-0766	1	RETAINER:HANDLE ASSY	28480	5060-0766
	1490-0030	1	STAND:TILT	28480	1490-0030
	5060-0767	5	FOOT ASSY:FM	28480	5060-0767
	5060-0775	1	KIT:RACK MOUNT	28480	5060-0775
	08620-00004	1	DECK:MAIN	28480	08620-00004
	08620-00005	1	RIGHT SUPPORT:RF SECTION AREA	28480	08620-00005
	08620-00006	1	LEFT SUPPORT:RF SECTION AREA	28480	08620-00006
	08620-00007	1	BRACKET:CIRCUIT BOARD SUPPORT	28480	08620-00007
	08620-00008	1	BRACKET:CAPACITORS	28480	08620-00008
	08620-20001	2	FRAME:SIDE	28480	08620-20001
	08620-20002	1	FRAME:CHASSIS	28480	08620-20002
			FRONT PANEL MISCELLANEOUS		
	0370-1003		KNOB:ROUND	28480	0370-1003
	08620-40007	3	SCALE:BLANK FREQUENCY	28480	08620-40007
	08620-00042	1	CALIBRATION SCALE	28480	08620-00042
	08620-40001	1	WINDOW:FREQUENCY SCALE	28480	08620-40001
	08620-20050	1	FRAME:WINDOW	28480	08620-20050
	3150-0203	1	FILTER:AIR	28480	3150-0203
	08620-00010	1	POINTER:START (GREEN)	28480	08620-00010
	08620-00011	1	POINTER:STOP (RED)	28480	08620-00011
	08620-00015	1	BRACKET:LEFT HAND NOTCH	28480	08620-00015
	08620-00016	1	BRACKET:RIGHT HAND NOTCH	28480	08620-00016
	08620-60054	1	ASSY:FRONT PANEL	28480	08620-60054
	08620-00039	1	PANEL:LOWER(P/O FP ASSY)	28480	08620-00039
	08620-00040	1	PANEL:UPPER(P/O FP ASSY)	28480	08620-00040
	08620-20015	1	FRAME:PANEL(P/O FP ASSY)	28480	08620-20015
	08620-60053	1	WIRING HARNESS:FRONT	28480	08620-60053
			REAR PANEL MISCELLANEOUS		
	1200-0043	4	INSULATOR:TRANSISTOR MOUNTING	71785	293011
	08620-60055	1	ASSY:REAR PANEL	28480	08620-60055
	08620-00038	1	SUPPORT BRACKET	28480	08620-00038
	08620-60056	1	WIRING HARNESS:REAR	28480	08620-60056
	08620-20016	1	HEAT SINK:TRANSISTOR	28480	08620-20016

See introduction to this section for ordering information

Table 6-3. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements.

Code No.	Manufacturer	Address
00000	U.S.A. Common	Any Supplier of U.S.A.
01295	Texas Instruments Inc. Semiconductor Components Division	Dallas, Texas 75231
02660	Amphenol Corp.	Broadview, Ill 60153
02735	RCA Solid State and Receiving Tube Division	Somerville, N.J. 08876
04713	Motorola Semiconductor Products Div.	Phoenix, Ariz. 85008
04870	PM Motor Co.	Westchester, Ill., 60156
07263	Fairchild Camera and Instrument Corporation, Semiconductor Division	Mountain View, Calif. 94040
07910	Continental Device Corporation	Hawthorne, Calif 90250
24931	Specialty Connector Company, Inc.	Indianapolis, Ind. 46227
27251	Specialties Manufacturing Company, Inc.	Bridgeport, Conn. 06601
28480	Hewlett-Packard Co.	Palo Alto, Cal. 94304
56289	Sprague Electric Co.	N. Adams, Mass., 01247
71400	Bussman Manufacturing Division McGraw-Edison Co.	St. Louis, Mo., 63017
71785	Cinch Manufacturing Co. Division United Carr Fastener Corporation	Chicago, Ill., 60624
75915	Littlefuse Inc.	DesPlaines, Ill., 60016
76854	Oak Manufacturing Co., Division Oak Electro/Netics Corporation	Crystal Lake, Ill., 60014
77342	American Machine & Foundry Co. Potter & Blumfield Division	Princeton, Ind., 47570
82389	Switchraft Inc.	Chicago, Ill. 60630
84411	TRW Capacitor Div.	Ogallala, Neb., 69153
87034	Marco & Oak Industries, Division Oak Electro/Netics	Anaheim, Cal. 92803
93332	Sylvania Electric Products, Inc. Semiconductor Div.	Woburn, Mass., 01801
95984	Siemon Mfg. Co.	Wayne, Ill., 60184

SECTION VII
MANUAL CHANGES

7-1. INTRODUCTION

7-2. This section will be used in future issues or revisions of this manual to provide up-dating and back-dating information.

7-3. In the interim, any necessary changes to the information contained in this manual will be documented in a yellow Manual Change Sheet insert shipped with the manual.

SECTION VIII
SCHEMATIC DIAGRAMS

8-1. INTRODUCTION

8-2. Schematic presentations in this manual show electrical circuit operation and are not intended to serve as wiring diagrams. Figure 8-1 shows an example of the schematic illustrations. Figure 8-2 lists notes which apply to the schematic diagrams.

8-3. Some switch and circuit board assemblies are shown in part on different pages. To find a specific instrument component, refer to the REFERENCE DESIGNATIONS box which appears on each schematic diagram. Reference designations within assemblies are abbreviated. The full designation includes the assembly on which the component is mounted, and the individual component designation. For example, Resistor R1 mounted on Assembly A1 has the complete reference designation of A1R1. Certain parts are not included on assemblies, and are classified as chassis parts. Chassis parts are assigned only the reference designation shown on the schematic diagram.

8-4. An asterisk indicates a factory selected part; the component value shown is the typical or most commonly selected value.

8-5. Component procurement information and specific component descriptions are included in Section VI. Refer to page 6-1 for information on how to order parts.

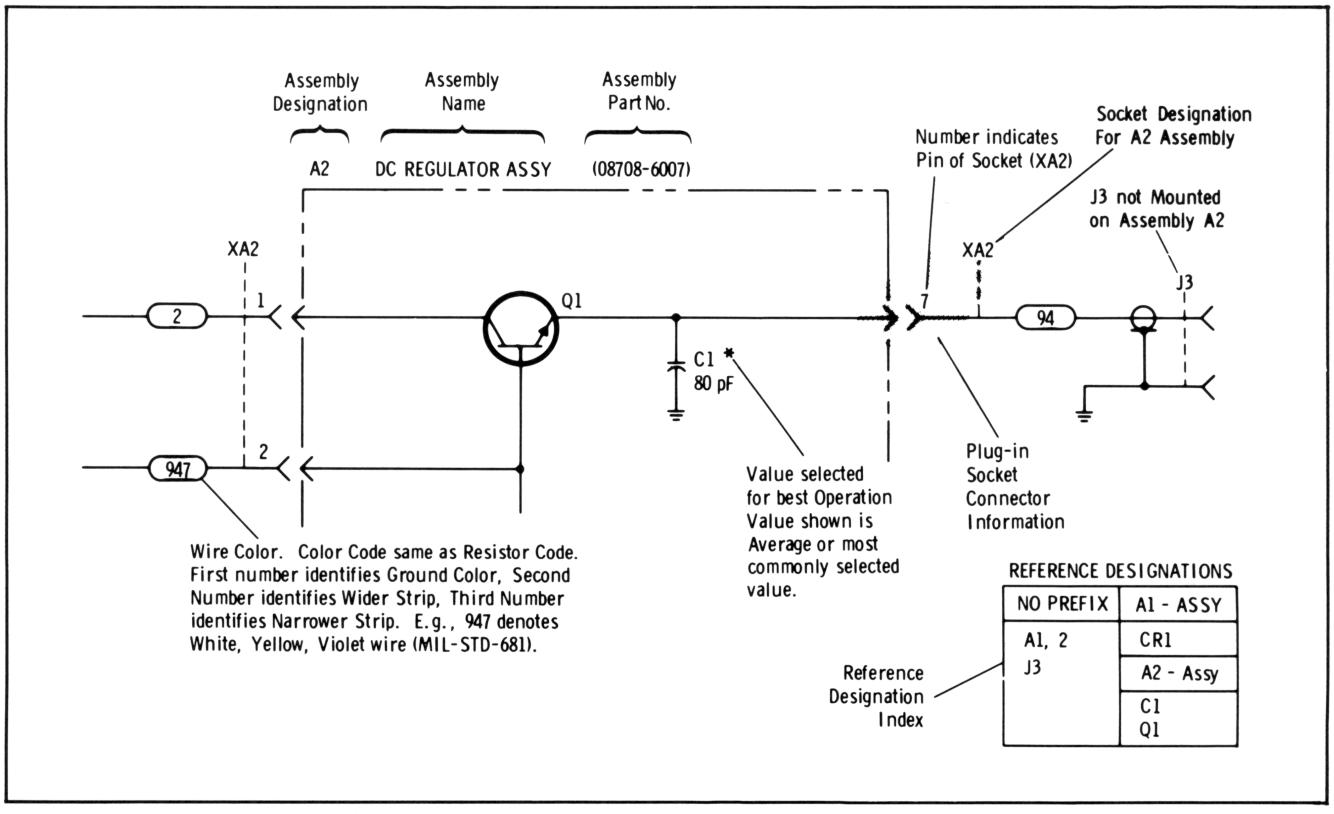


Figure 8-1. General Information on Schematic Diagrams

SCHEMATIC DIAGRAM NOTES

Refer to MIL-STD-15B for Symbols not Shown

Resistance is in ohms and capacitance is in microfarads unless otherwise noted.

P/O = part of.

*Asterisk denotes a factory-selected value. Value shown is typical. Capacitors may be omitted or resistors jumpered.

Screwdriver adjustment.

Panel control.

Encloses front panel designations.

Encloses rear panel designation.

Circuit assembly borderline.

Other assembly borderline.

Heavy line with arrows indicates path and direction of main signal.

Heavy dashed line with arrows indicates path and direction of main feedback.

CW

Wiper moves toward CW with clockwise rotation of control as viewed from shaft or knob.

1

Numbers in stars on circuit assemblies show locations of test points.

Encloses wire color code. Code used (MIL-STD-681) is the same as the resistor color code. First number identifies the base color, second number the wider stripe, and the third number identifies the narrower stripe. E.g., (947) denotes white base, yellow wide stripe, violet narrow stripe.

Voltage regulator (breakdown diode).

Denotes Field Effect transistor (FET) with N-type base.

Denotes FET with P-type base.

Feed-through capacitor (shunt capacitor, commonly used for bypassing high frequency currents to chassis.

Figure 8-2. Schematic Diagram Notes

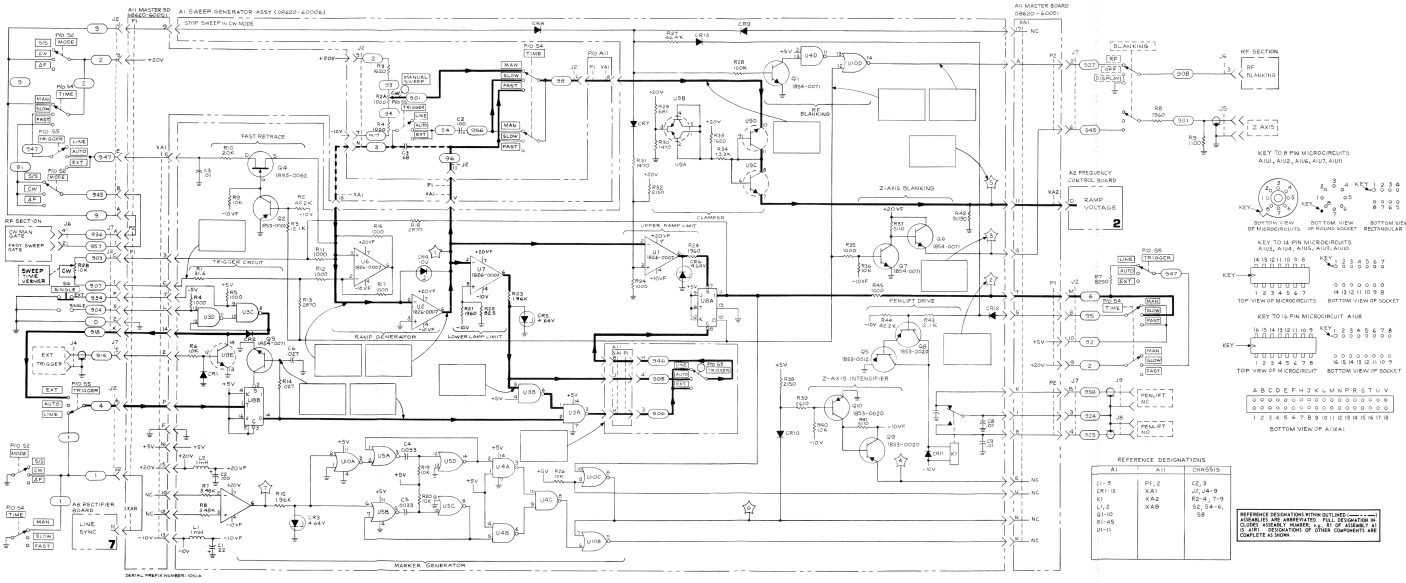


Figure 8-3. A1 Sweep Generator Assembly

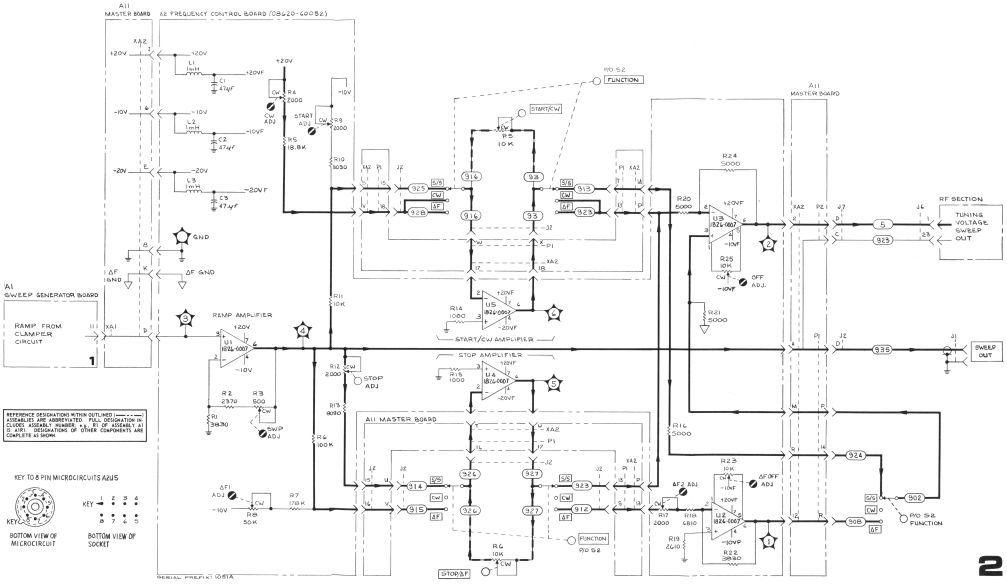


Figure 8-4. A2 Frequency Control Board

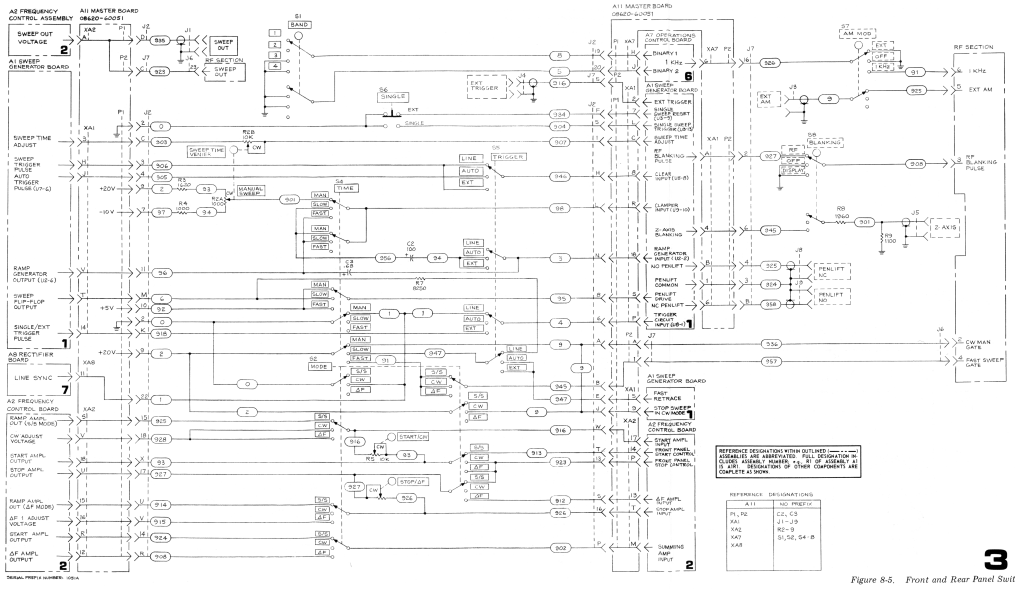


Figure 8-5. Front and Rear Panel Switching

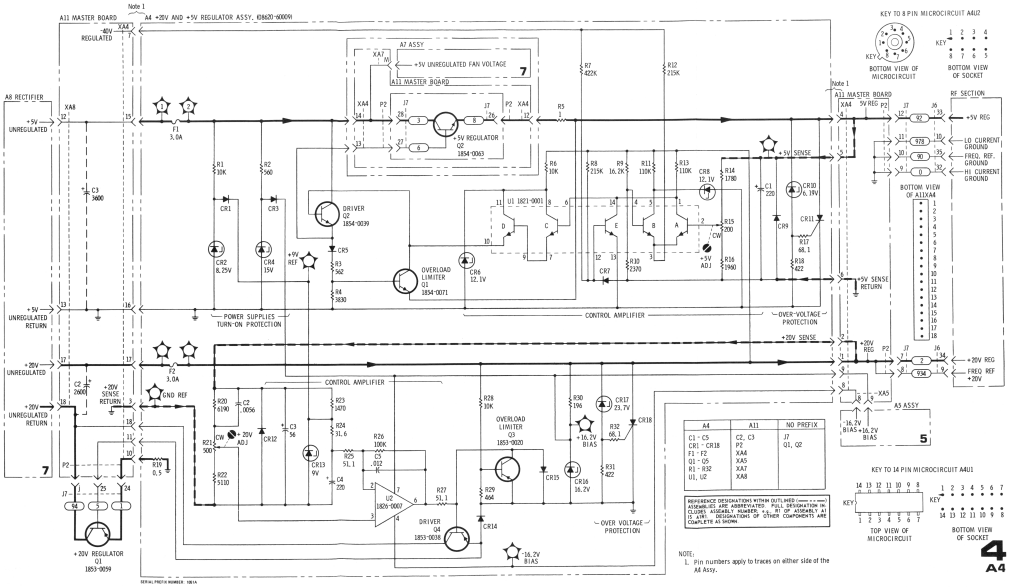


Figure 8-6. A4 +20V and +5 Regulator Supplies

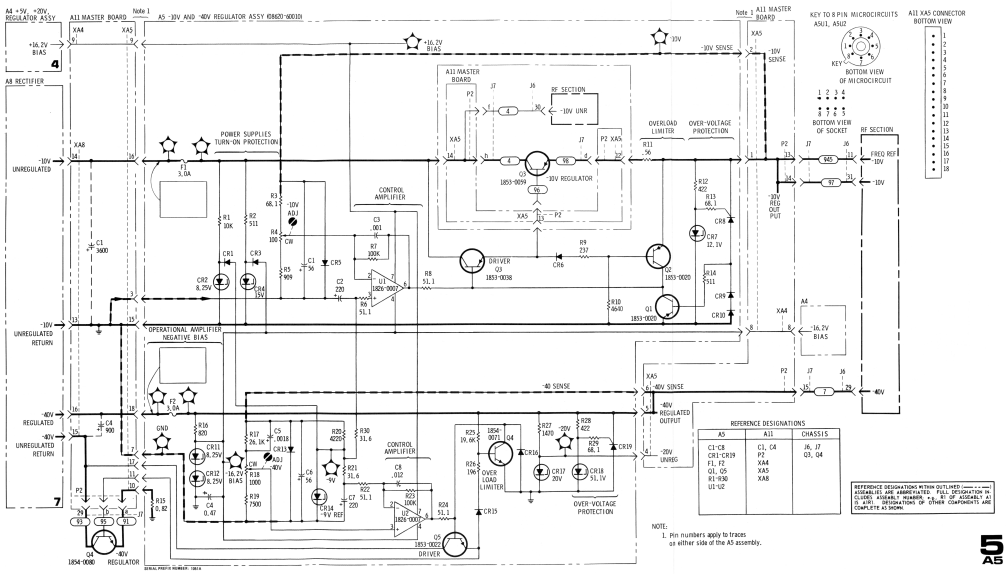


Figure 8-7. A5 −40V and −10V Regulator Supplies

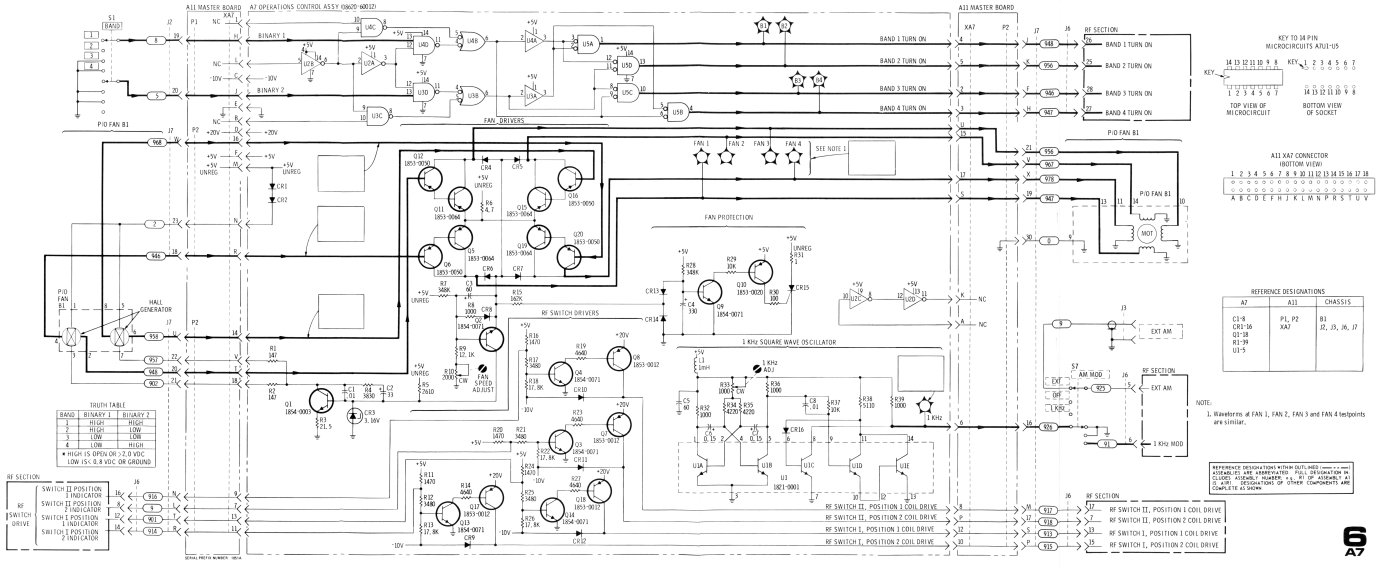


Figure 8-8. A7 Operations Control Board

6 A7

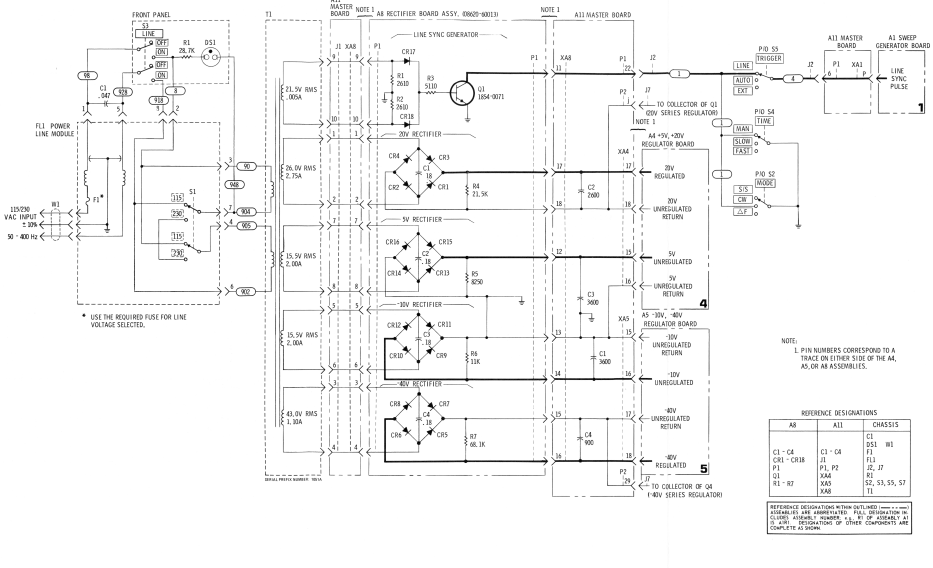


Figure 8-9. A8 Rectifier Board

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HP PART NO. 08620-90008

PRINTED IN U.S.A.

MANUAL CHANGES

MANUAL IDENTIFICATION

Model Number: 8620B
Date Printed: January 1971
Part Number: 08620-90008

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes
1051A00131	1
1135A00146 thru 1135A00160	1,2
1135A00161 thru 1135A00210	1,2,3

Serial Prefix or Number	Make Manual Changes
► 1210A00211 thru 1210A00230	1,2,3,4
► 1217A00231 and above	1,2,3,4,5

► NEW ITEM

ERRATA

Change all 8632A references to 86320A.

► Change all 8633A references to 86330A.

► Page 1-3, Table 1-1:
Under MODULATION, change EXTERNAL AM: Refer to . . . to read EXTERNAL FM: Refer to . . .

Page 1-4, Table 1-2:
Change 8633A Troubleshooting Board to HP Part No. 86330-60012.

Page 3-1:
Add this caution following paragraph 3-15 (d):

CAUTION

Make certain that scale is firmly in place and flush with band drum edges. If not, frequency pointers may be damaged when the band drum is rotated with the BAND lever.

Page 3-6, Figure 3-3:
Change name of device located between type N tee and oscilloscope to read "*CRYSTAL DETECTOR".
Change name of device located between type N tee and power meter to read "THERMISTOR MOUNT".

Page 3-12, Paragraph 4(b):
Change last sentence to read "Refer to the oscillator module instruction manual."

Page 4-1, Figure 4-1:
Change Extender Cable to HP Part No. 08620-60032.

NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

8 May, 1972

HEWLETT hp PACKARD

Printed in U.S.A.

ERRATA (cont'd)

► Page 5-2, Table 5-1 and Paragraph 5-11 (b):
Change −40V ADJ reference designator to read "A5R18".

Page 5-4, Figure 5-4:
Change −40V ADJ reference designator to read "A5R18".

Page 6-3, Table 6-2:
Add exchange assembly A1, 08620-60018, REBUILT 08620-60006:EXCHANGE REQUIRED.

Page 6-4, Table 6-2:
Add exchange assembly A2, 08620-60073, REBUILT 08620-60052: EXCHANGE REQUIRED.
Add exchange assembly A4, 08620-60021, REBUILT 08620-60009: EXCHANGE REQUIRED.

Page 6-5, Table 6-2:
Add exchange assembly A5, 08620-60022, REBUILT 08620-60010: EXCHANGE REQUIRED.

Page 6-6, Table 6-2:
Add exchange assembly A7, 08620-60024, REBUILT 08620-60012: EXCHANGE REQUIRED.

Page 6-7, Table 6-2:
Add exchange assembly A8, 08620-60025, REBUILT 08620-60013: EXCHANGE REQUIRED.

Page 6-9, Table 6-2, under MISCELLANEOUS:
Add the following 8620B parts:
5000-0732 SIDE COVER: REAR
5000-0733 SIDE COVER: FRONT

Page 6-10, Table 6-2, under FRONT PANEL MISCELLANEOUS:
Delete ROUND KNOB entry (0370-1003).

Page 8-3, Figure 8-3:
Add an inverting symbol (small circle) to trigger input of microcircuit A1U8A (pin 6).
Add an inverting symbol (small circle) to trigger input of microcircuit A1U8B (pin 1).
Change stage identification of microcircuit A1U7 to read "LOWER RAMP LIMIT".

Page 8-4, Figure 8-4:
Change screwdriver control A2R25 to read "OFF 1 ADJ".

Page 8-5, Figure 8-5:
Change output at pin 2 of connector J6 (right-side of schematic) to read "CW/MANUAL SWEEP/SLOW SWEEP".

Page 8-6, Figure 8-6:
Change input at pin 17 of A11XA8 (left-side of schematic) to read "+20V REGULATED".

CHANGE 1

Page 6-9, Table 6-2:
Change resistors R5 and R6 to HP Part No. 2100-3169 R:VAR WW 10K OHM 0.1% LIN 1.5W.

CHANGE 2

Page 6-9, Table 6-2:
Add the following note to define the 8620B color scheme.

NOTE

This change implements a different color scheme for the standard instrument. Colors prior to this change are now available as options. Refer to listing below.

8620B STANDARD - Indicates color scheme for the 8620B beginning with this change. (Includes OLIVE BLACK upper front panel, MINT GRAY lower front panel, and OLIVE GRAY cabinet.)
8620B Option A85 - Indicates LIGHT GRAY panel.

CHANGE 2 (cont'd)

8620B Option Y98 - Indicates BLUE GRAY cabinet.
8620B Option X95 - Indicates color scheme for the 8620B prior to this change. (Includes OLIVE BLACK upper front panel, LIGHT GRAY lower front panel, and BLUE GRAY cabinet.)
Add the following description changes or 8620B parts as indicated:

	R2MP1	0370-1003 KNOB: ROUND (OLIVE BLACK).
#	R2MP1	0370-1001 KNOB: ROUND (JADE GRAY) (STANDARD).
#	S4MP1	0370-1810 KNOB: LEVER (JADE GRAY) (STANDARD).
#	S5MP1	0370-1810 KNOB:LEVER (JADE GRAY) (STANDARD).

# Denotes standard part for 8620B beginning with this change.

Page 6-10, Table 6-2:
Add the following description changes or 8620B parts as indicated:

under MISCELLANEOUS

	5000-0732	SIDE COVER: REAR (BLUE GRAY)
	5000-0733	SIDE COVER: FRONT (BLUE GRAY)
#	5000-8597	SIDE COVER: REAR (OLIVE GRAY) (STANDARD)
#	5000-8599	SIDE COVER: FRONT (OLIVE GRAY) (STANDARD)
	5060-0251	COVER ASSY: TOP (BLUE GRAY)
	5060-0252	COVER ASSY: BOTTOM (BLUE GRAY)
#	5060-0271	COVER ASSY: TOP (OLIVE GRAY) (STANDARD)
#	5060-0272	COVER ASSY: BOTTOM (OLIVE GRAY) (STANDARD)
	5060-0775	KIT: RACK MOUNT (LIGHT GRAY)
	5060-0766	RETAINER: HANDLE ASSY (BLUE GRAY)
#	5060-8737	RETAINER: HANDLE ASSY (OLIVE GRAY) (STANDARD)
#	5060-8740	KIT: RACK MOUNT (MINT GRAY) (STANDARD)
	08620-00005	RIGHT SUPPORT: RF SECTION AREA (BLUE GRAY)
	08620-00006	LEFT SUPPORT: RF SECTION AREA (BLUE GRAY)
#	08620-00045	RIGHT SUPPORT: RF SECTION AREA (OLIVE GRAY) (STANDARD)
#	08620-00046	LEFT SUPPORT: RF SECTION AREA (OLIVE GRAY) (STANDARD)
	08620-20002	FRAME: FRONT PANEL (BLUE GRAY)
#	08620-20054	FRAME: FRONT PANEL (OLIVE GRAY) (STANDARD)

under FRONT PANEL MISCELLANEOUS

	08620-00039	PANEL: FRONT LOWER (LIGHT GRAY)
	08620-00040	PANEL: FRONT UPPER (OLIVE BLACK)
#	08620-00048	PANEL: FRONT LOWER (MINT GRAY) (STANDARD)
	88620-20015	PANEL: FRONT SUB
	08620-60054	ASSY: FRONT PANEL (OPTION X95)
#	08620-60063	ASSY: FRONT PANEL (STANDARD)

under REAR PANEL MISCELLANEOUS

	08620-00003	PANEL: REAR

# Denotes standard part for 8620B, beginning with this change.

CHANGE 3

Page 6-6, Table 6-2:
Change the A7 Operations Control Board Assembly to HP Part No. 08620-60064.
Change exchange assembly A7 to HP Part No. 08620-60065 REBUILT 08620-60064: EXCHANGE REQUIRED.
Add capacitor A7C9 0180-0155 C:FXD ELECT 2.2 UF 20% 20 VDCW.

Page 8-8, Figure 8-8:
Add a 2.2 UF capacitor to the FAN PROTECTION circuit. Connect the positive end to the gate lead of A7CR15 and the other end to ground.
Change the A7 Operations Control Assembly to HP Part No. 08620-60064.

► CHANGE 4

Page 1-3, Table 1-1:
Replace corresponding portion of Table 1-1 with the following:

GENERAL

RF Blanking: With RF blanking enabled, RF automatically turned off during retrace, and turned on after completion of retrace. On automatic sweeps, RF is on long enough before sweep starts to stabilize external circuits and equipment whose response is compatible with the selected sweep rate.

Display and Negative Blanking Outputs: Direct-coupled rectangular pulses of approximately +5V (display blanking) and −5V (negative blanking) into 2500 ohms available at rear-panel Z-AXIS/MKR/PEN LIFT and NEGATIVE BLANKING connectors, respectively. Both pulses coincident with RF blanking.

Pen Lift: For use with X-Y graphic recorders. With display blanking output disabled, center conductor of rear-panel Z-AXIS/MKR/PEN LIFT connector shorted to penlift common (outer case of connector) during sweep and open during retrace. Available only on slow sweep speed.

Pages 3-4 and 3-5, Figure 3-2:
Replace with pages 9, and 10 in this Manual Changes Supplement.

Page 3-6, Figure 3-3 (Sheet 1 of 2):
In step 2, change AM MOD (rear panel) and BLANKING (rear panel) controls to 1 KHz SQ WV/OFF (rear panel) and RF BLANKING/OFF (rear panel), respectively. Also, add the following under 8620B control settings:
DISPLAY BLANKING/OFF (rear panel). . . . OFF.

Page 3-7, Figure 3-3 (Sheet 2 of 2):
In step 6, change BLANKING switch to RF BLANKING/OFF switch, and RF to RF BLANKING.

In step 9, change BLANKING (rear panel) and AM MOD (rear panel) controls to RF BLANKING/OFF (rear panel) and 1 KHz SQ WV/OFF (rear panel), respectively.

Page 3-8, Figure 8-4 (Sheet 1 of 3):
Replace rear panel view in Figure 3-4 with new rear panel view No. 1 supplied on page 11 of this Manual Changes Supplement.

Page 3-10, Figure 3-4 (Sheet 3 of 3):
Change steps 5 and 6 to read as follows:

5. During retrace, blanking may be either applied to the RF output, supplied to the rear-panel Z-AXIS/MKR/PEN LIFT connector, or supplied to the rear-panel NEGATIVE BLANKING connector.

   a. With the RF BLANKING/OFF switch set to the RF BLANKING position, a blanking signal of approximately +2 volts is applied to the appropriate oscillator module in the plug-in RF Section, causing the RF output to be interrupted. Refer to the RF Section instruction manual for information regarding ON/OFF ratio.

   b. With the DISPLAY BLANKING/OFF switch set to the DISPLAY BLANKING position, a blanking signal of approximately +5 volts is supplied to the rear-panel Z-AXIS/MKR/PEN LIFT connector. This blanking signal is normally used to blank the sweep retrace on a CRT display with positive Z-axis blanking.

   c. A blanking signal of approximately −5 volts is supplied to the rear-panel NEGATIVE BLANKING connector. This blanking signal is normally used to blank the sweep retrace on a CRT display with negative Z-axis blanking.

6. With an X-Y graphic recorder connected to the rear-panel Z-AXIS/MKR/PEN LIFT connector, penlift signals are generated when the DISPLAY BLANKING/OFF switch is in the OFF position and the front panel TIME switch is in the SLOW position. During sweep, the rear-panel connector has its center conductor shorted to the penlift common (outer case of connector). During retrace, the connector has its center conductor open.

In step 7a, change:
AM MOD switch to 1 KHz SQ WV/OFF switch, EXT to OFF, and 1 kHz to 1 KHz SQ WV.

CHANGE 4 (cont'd)

Page 3-11, Figure 3-5 (Sheet 1 of 2):
Replace rear panel view in Figure 3-5 with new rear panel view No. 2 supplied on page 12 of this Manual Changes Supplement.

Page 3-12, Figure 3-5 (Sheet 2 of 2):
In step 1, change AM MOD (rear panel) and BLANKING (rear panel) controls to 1 KHz SQ WV/OFF (rear panel) and RF BLANKING/OFF, respectively. Also, add the following under 8620B control settings:

DISPLAY BLANKING/OFF (rear panel) . . . . . OFF

Change step 3c to read as follows:

c. No blanking (RF, DISPLAY or NEGATIVE) or penlift signals are generated.

Delete step 3d.

In step 4a, change AM MOD switch to 1 KHz SQ WV/OFF switch, EXT to OFF, and 1 kHz to 1 KHz SQ WV.

Page 3-13, Figure 3-6 (Sheet 1 of 3):
Replace rear panel view in Figure 3-6 with new rear panel view No. 3 supplied on page 12 of this Manual Changes Supplement.

Page 3-14, Figure 3-6 (Sheet 2 of 3):
In step 1, change AM MOD (rear panel) and BLANKING (rear panel) controls to 1 KHz SQ WV/OFF (rear panel) and RF BLANKING/OFF, respectively. Also add the following under 8620B control settings:

DISPLAY BLANKING/OFF (rear panel) . . . . . OFF

Page 3-15, Figure 3-6 (Sheet 3 of 3):
Change steps 7 and 8 to read as follows:

6. During retrace, blanking may be either applied to the RF output, supplied to the rear-panel Z-AXIS/MKR/PEN LIFT connector, or supplied to the rear-panel NEGATIVE BLANKING connector.

   a. With the RF BLANKING/OFF switch set to the RF BLANKING position, a blanking signal of approximately +2 volts is applied to the appropriate oscillator module in the RF Section, causing the RF output to be interrupted. Refer to the RF Section instruction manual for information regarding ON/OFF ratio.

   b. With the DISPLAY BLANKING/OFF switch set to the DISPLAY BLANKING position, a blanking signal of approximately +5 volts is supplied to the rear-panel Z-AXIS/MKR/PEN LIFT connector. This blanking signal is normally used to blank the sweep retrace on a CRT display with positive Z-axis blanking.

   c. A blanking signal of approximately −5 volts is supplied to the rear-panel NEGATIVE BLANKING connector. This blanking signal is normally used to blank the sweep retrace on a CRT display with negative Z-axis blanking.

7. With an X-Y graphic recorder connected to the rear-panel Z-AXIS/MKR/PEN LIFT connector, penlift signals are generated when the DISPLAY BLANKING/OFF switch is in the OFF position and the front-panel TIME switch is in the SLOW position. During sweep, the rear-panel connector has its center conductor shorted to the penlift common (outer case of connector). During retrace, the connector has its center conductor open.

In step 8a, change AM MOD switch to 1 KHz SQ WV/OFF switch, EXT to OFF, and 1 kHz to 1 KHz SW WV.

Pages 4-3 through 4-5, Paragraphs 4-8 through 4-11:
In step 2 of paragraphs 4-8 through 4-11, change AM MOD (rear-panel) and BLANKING (rear-panel) controls to 1 KHz SQ WV/OFF and RF BLANKING/OFF, respectively. Also, add the following under 8620B control settings:

DISPLAY BLANKING/OFF (rear panel) . . . . . OFF

Page 4-5, Paragraph 4-11:
In step 4, change AM MOD switch to 1 KHz SQ WV/OFF switch and 1 kHz position to 1 KHz SQ WV position.

CHANGE 4 (cont'd)

Page 4-6, Paragraph 4-12:

Change Specification following Blanking Output to read: Rectangular pulse approximately +5V into 2500 ohms (coincident with RF blanking). Available from rear-panel Z-AXIS/MKR/PEN LIFT connector. A negative rectangular pulse (—5V into 2500 ohms) is available from rear-panel NEGATIVE BLANKING connector.

In step 2, change AM MOD (rear panel) and BLANKING (rear panel) controls to 1 KHz SQ WV/OFF (rear panel) and RF BLANKING/OFF, respectively. Also, add the folloiwng under 8620B control settings:

DISPLAY BLANKING/OFF (rear panel) . . . . . OFF

In step 3, chage Z-AXIS connector to Z-AXIS/MKR/PEN LIFT connector.

In step 4, change BLANKING SWITCH TO DISPLAY BLANKING/OFF switch and DISPLAY position to DISPLAY BLANKING position.

In step 5, change BLANKING switch to RF BLANKING/OFF switch and RF position to RF BLANKING position.

Page 6-3, Table 6-2:
Change A1 Board Assy to HP Part Number 08620-60074.
Change A1 Rebuilt Exchange Assy to HP Part Number 08620-60079.
Delete A1C7, A1C8, and A1C9.
Change A1CR10 to HP Part Number 1901-0025, Diode: Silicon 100 MA/1V.
Change A1CR11 to HP Part Number 1901-0033, Diode: Silicon 100 MA 180WV.
Add A1CR14, HP Part Number 1902-3203, Diode: Breakdown 14.7V.
Add A1CR15, HP Part Number 1901-0159, Diode: Silicon 0.75A 400 PIV.
Add A1CR16, HP Part Number 1902-0041, Diode: Breakdown 5.11V.
Delete A1K1.
Change A1Q5 to HP Part Number 1854-0071, TSTR: SI NPN.
Change A1Q7 to HP Part Number 1854-0474, TSTR: SI NPN.
Change A1Q8 and A1Q9 to HP Part Number 1854-0071, TSTR: SI NPN.
Add A1Q11, HP Part Number 1854-0071, TSTR: SI NPN.
Add A1Q12, HP Part Number 1854-0074, TSTR: SI NPN.
Add A1Q13, HP Part Number 1854-0079, TSTR: SI NPN.
Add A1Q14, HP Part Number 1853-0020, TSTR: SI PNP.
Change A1R36 to HP Part Number 0757-0317, R:FXD MET FLM 1.33 1% 1/8W.
Change A1R38 to HP Part Number 0757-419, R:FXD MET FLM 681 OHM 1% 1/8W.

Page 6-4, Table 6-2:
Change A1R39 to HP Part Number 0757-0440, R:FXD MET FLM 7.5K 1% 1/8W.
Change A1R40 to HP Part Number 0698-3156, R:FXD MET FLM 14.7K 1% 1/8W.
Change A1R41 to HP Part Number 0757-0442, R:FXD MET FLM 10K 1% 1/8W.
Change A1R42 to HP Part Nubmer 0698-3260, R:FXD MET FLM 464K 1% 1/8W.
Change A1R44 to HP Part Number 0698-3160, R:FXD MET FLM 31.6K 1% 1/8W.
Change A1R45 to HP Part Number 0698-3150, R:FXD MET FLM 2.37K 1% 1/8W.
Add A1R46, HP Part Number 0698-0083, R:FXD MET FLM 1.96K 1% 1/8W.
Add A1R47, HP Part Number 0757-0442, R:FXD MET FLM 10K 1% 1/8W.
Add A1R48, HP Part Number 0757-0459, R:FXD MET FLM 56.2K 1% 1/8W.
Add A1R49, HP Part Number 0757-0441, R:FXD MET FLM 8.25K 1% 1/8W.
Add A1R50, HP Part Number 0757-0444, R:FXD MET FLM 12.1K 1% 1/8W.
Add A1R51, HP Part Number 0757-0444, R:FXD MET FLM 12.1K 1% 1/8W.
Add A1R52, HP Part Number 0757-0289, R:FXD MET FLM 13.3K 1% 1/8W.
Add A1R53, HP Part Number 0698-3162, R:FXD MET FLM 46.4K 1% 1/8W.
Add A1R54, HP Part Number 0698-0083, R:FXD MET FLM 1.96K 1% 1/8W.

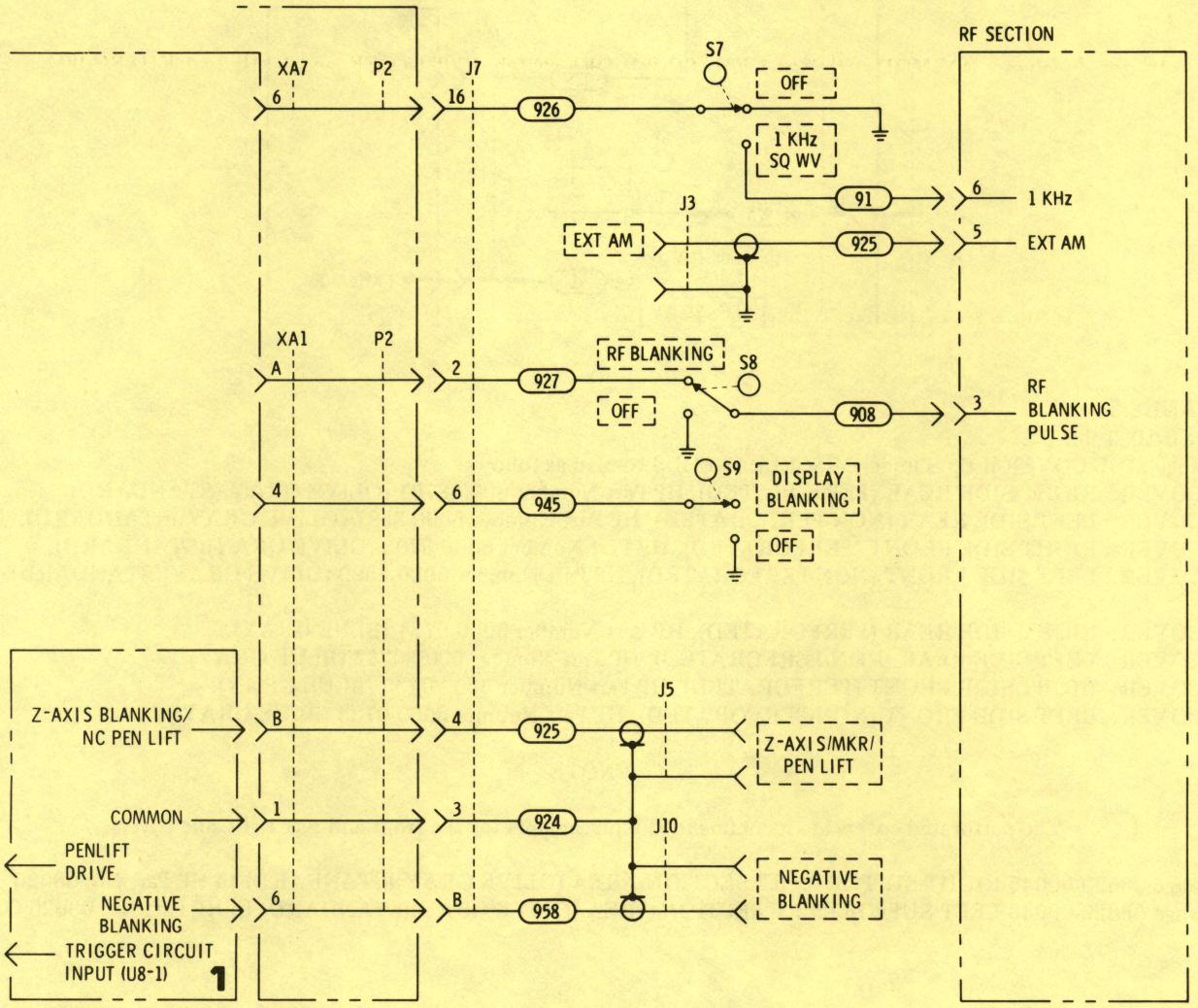
Page 6-9, Table 6-2:
Add J10, HP Part Number 1250-0118, CONNECTOR:BNC.
Change S7 and S8 to HP Part Number 3101-0070, SWITCH:SLIDE SP2T.
Add S9, HP Part Number 3101-0070, SWITCH:SLIDE SP2T.

Page 6-10, Table 6-2:
Change ASSY:REAR PANEL to HP Part Number 08620-60078.

CHANGE 4 (cont'd)

Page 8-3, Figure 8-3:
Replace with new fold-out supplied on page 13 of this Manual Changes Supplement.

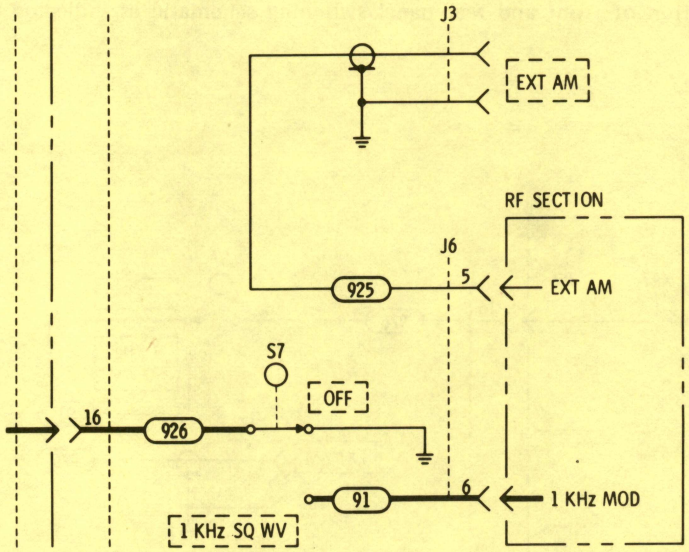
Page 8-5, Figure 8-5:
Change upper right-hand portion of front and rear panel switching schematic as indicated below in the partial schematic diagram.



CHANGE 4 (cont'd)

Page 8-8, Figure 8-8:

Change lower right-hand portion of A7 schematic as indicated below in the partial schematic diagram.



► **CHANGE 5**

Page 6-10, Table 6-2:

Change SIDE COVER listings under MISCELLANEOUS to read as follows:

COVER: RIGHT SIDE REAR (PERFORATED), HP Part Number 6000-8701 (OLIVE GRAY)(STANDARD).
COVER: LEFT SIDE REAR (NON-PERFORATED), HP Part Number 5000-8597 (OLIVE GRAY)(STANDARD).
COVER: RIGHT SIDE FRONT (PERFORATED), HP Part Number 5000-8703 (OLIVE GRAY)(STANDARD).
COVER: LEFT SIDE FRONT (NON-PERFORATED), HP Part Number 5000-8599 (OLIVE GRAY)(STANDARD).

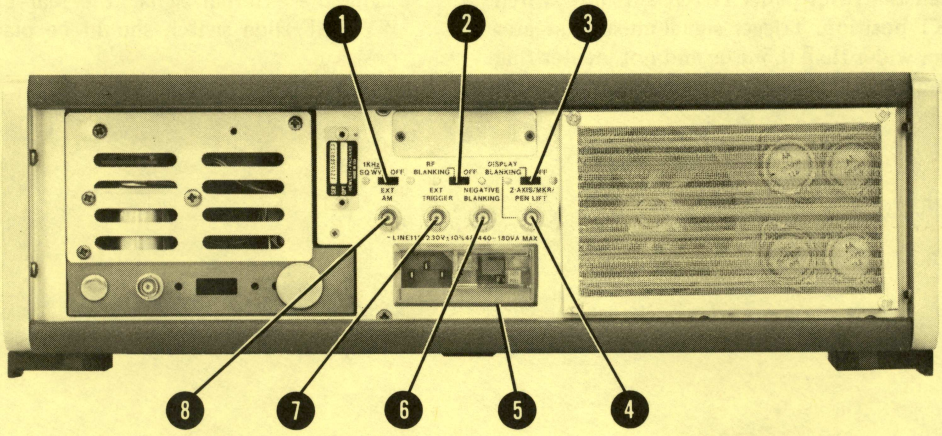
COVER: RIGHT SIDE REAR (PERFORATED), HP Part Number 5000-0734 (BLUE GRAY).
COVER: LEFT SIDE REAR (NON-PERFORATED), HP Part Number 5000-0732 (BLUE GRAY).
COVER: RIGHT SIDE FRONT (PERFORATED), HP Part Number 5000-0735 (BLUE GRAY).
COVER: LEFT SIDE FRONT (NON-PERFORATED), HP Part Nubmer 5000-0733 (BLUE GRAY).

NOTE

The perforated covers are recommended replacements for the front and rear right side covers.

Change 08620-00045 RIGHT SUPPORT: RF SECTION AREA (OLIVE GRAY)(STANDARD) to HP Part No. 08620-00051.
Change 08620-00046 LEFT SUPPORT: RF SECTION AREA (OLIVE GRAY)(STANDARD) to HP Part No. 08620-00052.

REAR PANEL FEATURES



1. 1 KHz SQ WV/OFF slide switch. This switch controls the type of amplitude modulation of the signal. In the OFF position, an external modulation signal may be applied through the EXT AM connector below the switch. In 1 KHZ SQ WV position, a 1 kHz internal oscillator modulates the output RF signal.

2. RF BLANKING/OFF slide switch. This switch provides control of the RF signal during retrace. In the RF BLANKING position, the RF signal is turned off during the retrace portion of the sweep. This mode of blanking should not be selected when the sweeper is used with a phase lock system such as the Model 8410A/8411A Network Analyzer, since it requires the system to regain phase lock at the beginning of each sweep rather than stay in continuous phase lock. For phase lock operation, use OFF position. In the OFF position of the slide switch, no RF blanking is selected.

3. DISPLAY BLANKING/OFF Slide Switch. This switch provides control of the Z-axis signal during retrace. In the DISPLAY BLANKING position, blanking is applied to the Z-AXIS/MKR/PEN LIFT BNC connector below the slide switch. In the OFF position of the switch, no blanking is selected for Z-AXIS/MKR/PEN LIFT BNC connector.

4. Z-AXIS/MKR—PEN LIFT connector. This BNC connector provides Z-AXIS modulation to the display unit or a pen lift signal to an X-Y recorder. When the DISPLAY BLANKING/OFF slide switch is in the DISPLAY BLANKING position, blanking is applied to the BNC connector. The blanking signal is a rectangular pulse of +5 volts into 2500 ohms. When the DISPLAY BLANKING/OFF slide switch is in the OFF position and the front panel TIME slide switch is in the SLOW position, a pen left signal is applied to the X-Y recorder via the BNC connector. The pen lift signal is a short during sweep and an open during retrace.

5. Power Input Switch and Fuse. The input power switch allows selection of either 115 or 230 Vac operation. To change the switch position, the power cable must be disconnected from the rear of the instrument. This allows the plastic window covering the fuse compartment to slide to one side, exposing the fuse. To either change fuses or to change the 115/230 Vac switch position, pull outward on the lever in the fuse compartment.

6. NEGATIVE BLANKING connector. This BNC connector provides negative polarity blanking during retrace. The blanking signal is a rectangular pulse of —5 volts into 2500 ohms.

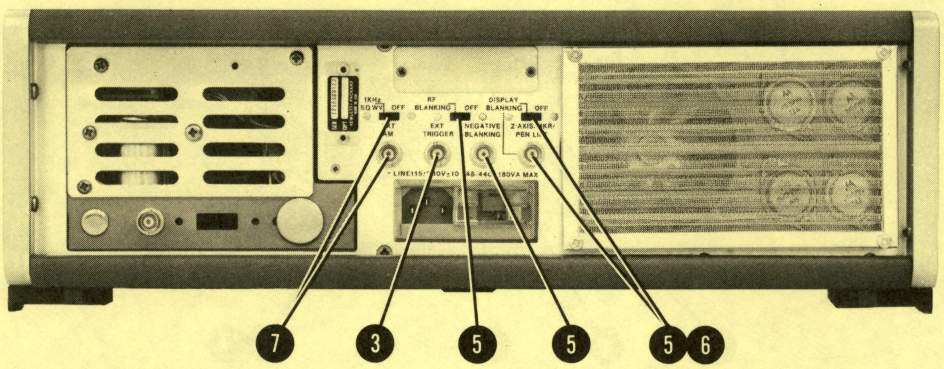
Figure 3-2. Rear Panel Controls and Connectors (1 of 2)

REAR PANEL FEATURES

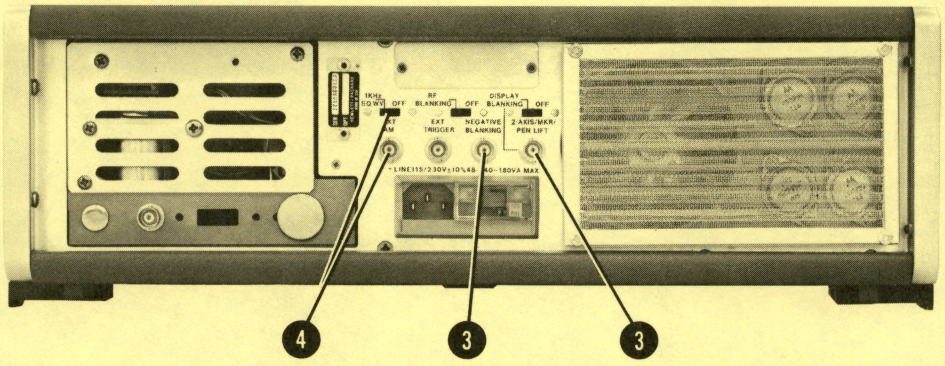
7 EXT TRIGGER connector. This BNC connector is the input for an external trigger pulse. This input is selected when the front panel TRIGGER slide switch is in the EXT position. Trigger signal must be greater than +2 Vdc, wider than 0.5 μsec and not greater than 1 MHz in frequency.

8 EXT AM connector. This BNC connector is the input for an external amplitude modulation signal. When using the external signal, the rear panel 1 KHZ SQ WV/OFF slide switch should be placed in the OFF position.

Figure 3-2. Rear Panel Controls and Connectors (2 of 2)

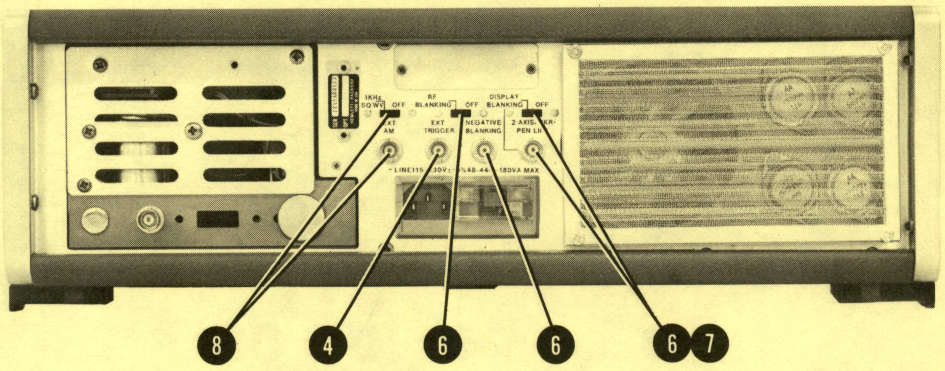


#1 (Figure 3-4)



#2 (Figure 3-5)

Replacement Rear Panel Pictures (1 of 2)



#3 (Figure 3-6)

Replacement Rear Panel Pictures (2 of 2)

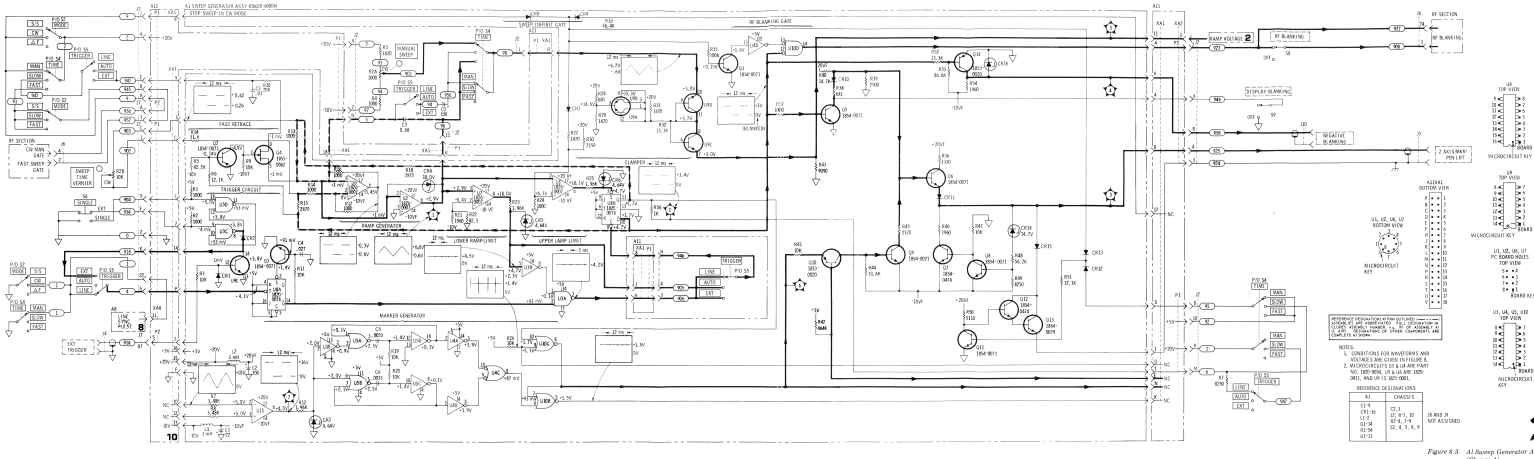


Figure 8.3. A1 Sweep Generator Assembly (Change 4)